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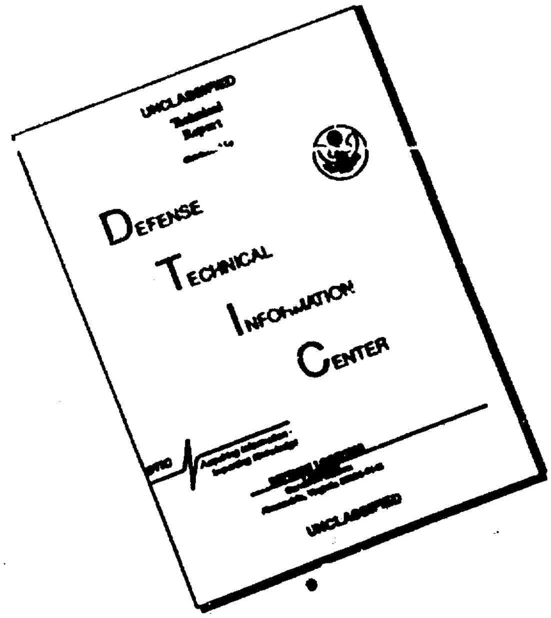


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AFCESA-TR-93-01

# DEVELOPMENT OF A KNOWLEDGE-BASED SYSTEM APPROACH FOR DECISION MAKING IN CONSTRUCTION PROJECTS


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MAY 1992

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**The objective of this report is to develop a realistic cost estimate. A knowledge-based system is proposed and prototyped to enhance the construction planner's ability to clarify decisions and isolate the preferred course of design based on both engineering and cost decisions. The basic thesis of the model design is that techniques can be developed to relate construction project requirements to current cost data through accepted engineering practices in order to develop better cost estimates for initial budget and feasibility decisions--without detailed design documents. The modeling concept uses a knowledge-based system to integrate expert judgments, engineering criteria, safety codes, historical data, descriptive factors, and specific site conditions.**

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## PREFACE

This report was submitted as a thesis to The Graduate School at the University of Florida in partial fulfillment for the degree of Doctor of Philosophy in Civil Engineering. The thesis covers work performed by Dr. Rita A. Gregory, Director, Construction Cost Management, HQ Air Force Civil Engineering Support Agency, Tyndall AFB, Florida 32403.

This thesis is being published in its original format by this agency because of its interest to the worldwide scientific and engineering community.

This report has been reviewed by the Public Affairs Officer (PA) and is releasable to the National Technical Information Service (NTIS). At NTIS, it will be available to the general public, including foreign nationals.

This technical report has been reviewed and is approved for publication.

Rita A. Gregory

RITA A. GREGORY
Director, Construction Cost Management

## ACKNOWLEDGEMENTS

This study, as in any major research, could not have been accomplished without the help of others. My first thanks go to Mr Gary S. Flora, The Civil Engineer of the Air Force, and Colonel Marshall W. Nay, Commander, Headquarters Air Force Civil Engineering Support Agency for allowing me the scholastic opportunity. Next, thanks to Mr Thomas J. Burns for "holding down the fort" in my long absences and, after my return to duty, helping me eke out valuable pockets of time, in an unusually busy time in the Air Force.

In addition to their strict technical guidance and recommendations, each member of my supervisory committee provided unique but complementary personal contributions. Dr James H. Schaub, my first point of contact at the University, became my constant counsel and mentor. His keen sense of humor boosted me at my low points and helped me keep a healthy perspective during my Ph.D. quest. As Chairman of my supervisory committee, he kept me in line and on track. And, he made things happen when I needed help.

Dr Zohar Herbsman played a special role in my scholastic venture as my first chairman and most frequent professor. Dr Barney Capehart had worked in the Federal Government. He was sensitive to and provided a good perspective on unique adjustments required of a student who returns to school after more than twenty years of professional practice. He helped me integrate the industrial engineering techniques developed in this study to civil engineering applications. Dr Rodney Cox, an experienced military engineer, contributed a significant understanding of the need for cross-applicability and technology transfer between military and private sector construction engineering. Dr Bloomquist provided the excitement that comes from recognizing the potential benefits this work could provide to the construction industry.

The person who provided the most direct contribution to the final report was Mrs Linda J. Allen. Linda has an unusual eye for editorial quality and a talent for written communication. Her most valuable contribution was her layman's review on clarity of thought and presentation.

My most personal thanks goes to G.B. "Greg" Gregory, my husband, friend, and biggest supporter.

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## KEY TO SYMBOLS

$A_{\%_M}$ = Percent accuracy using parametric cost engineering models

$A_{\%_T}$ = Percent accuracy using traditional construction estimating methods

$\bar{A}_{\%_M}$ = Average percent accuracy using parametric cost engineering models

$\bar{A}_{\%_T}$ = Average percent accuracy using traditional construction estimating methods

$C_F$ = Project final, fiscal close-out cost

$C_M$ = Project estimate computed using parametric cost engineering models

$C_T$ = Project estimate using traditional construction estimating methods

$\bar{C}_F$ = Average of final, fiscal close-out costs of projects

$\bar{C}_M$ = Average of project estimates computed using parametric cost engineering models

$\bar{C}_T$ = Average of project estimates computed using traditional construction estimating methods

$C_{D_F}$ = Total dollar close out costs ($C_{D_F}$) for the projects

$C_{D_M}$ = Total dollar value of the projects using the parametric cost engineering models

$C_{D_T}$ = Total dollar value of the projects using traditional construction estimating methods

$\bar{C}_{D_M}$ = Average of total dollars estimated using the parametric cost engineering models

$\bar{C}_{D_T}$ = Average of total dollars estimated using traditional construction estimating methods

Abstract of Dissertation Presented to the Graduate School of the University of Florida in Partial Fulfillment of the Requirements for the Degree of Doctor of Philosophy

# DEVELOPMENT OF A KNOWLEDGE-BASED SYSTEM APPROACH FOR DECISION MAKING IN CONSTRUCTION PROJECTS


By

Rita A. Gregory


May 1992

Chairman: James H. Schaub, Ph.D.
Major Department: Civil Engineering


Developing a realistic cost estimate is vital to the construction project at every stage of planning and construction. Construction costs have traditionally been estimated using two methods: (1) comparative estimating and (2) quantity-take-off estimating. There are inherent limitations in each process that restrict its usefulness in supporting engineering decisions in the early critical stages of project feasibility and design. Neither method is very suitable in forecasting the costs of one-of-a-kind, never-before-built facilities.

A knowledge-based system is proposed and prototyped to enhance the construction planner's ability to clarify

decisions and isolate the preferred course of design based on both engineering and cost decisions. The basic thesis of the model design is that techniques can be developed to relate construction project requirements to current cost data through accepted engineering practices in order to develop better cost estimates for initial budget and feasibility decisions--without detailed design documents. The modeling concept uses a knowledge-based system to integrate expert judgments, engineering criteria, safety codes, historical data, descriptive factors, and specific site conditions.

The knowledge-based system is prototyped and applied, as a case study, to estimating the costs of the Walton County Convalescent Center. A nursing home provides an excellent case study because it demonstrates complex modeling interrelationships and the applicability of the knowledge bases to nonmilitary construction projects.

The results of the model were rated against multiple measures of merit: accuracy, specificity, timeliness, and user friendliness. Under each measure, results strongly supported the knowledge-based parametric cost engineering models over traditional methods. The modeling method, with only general information of the facility requirements was within 2.8% of direct costs and 6% of construction bid costs computed using traditional methods. This accuracy

was achieved with less than one-thirtieth the man-hours required using traditional methods. Twenty-nine other accuracy data points comparing final to estimates resulted in an average of 7.3% using the knowledge-based system compared to 23.9% using traditional methods. The case study demonstrates the specificity and user-friendliness in exercising the expert system.

In addition, six areas for potential future research are discussed.

# CHAPTER 1
# INTRODUCTION

## General

Developing a realistic cost estimate is a necessary and vital part of the construction project at every stage of planning, programming, budgeting, design, and construction. The needs and wants of the facility user/client should control the total cost of a facility, and the client's priorities should dictate the allocation and the total cost among the components of the facility. However, few clients are in the construction business and, thus, have little, if any, experience or qualifications necessary to estimate or analyze alternatives in estimating or allocating the costs of a construction project. Most clients can only express their needs and wants in general terms, such as the kind of rooms or the aesthetic amenities, and are not qualified to assess the impact of those needs and wants on the overall cost of a complex facility. Even when qualified to make the cost comparisons, other clients do not want, nor have the time, to complete detailed design analyses of multiple engineering solutions.

It is design engineers and architects that translate the client desires into design solutions. For example, the client wants an air-conditioned house. It is the

engineer who determines the design solution, e.g., whether to use window air conditioners, air-to-air heat pumps, or, in large facilities, central plants. The cost of the project relates directly to the decision on which design solution will be used to satisfy the client's wants and needs. Generally, engineers will select one solution with which they are most familiar, or simply prefer, and proceed to design.

Once detailed design starts and is conveyed to construction drawings, it is very costly and time consuming to revisit these decisions because the project must be redesigned and redrawn to accommodate changes. The interrelationships among building systems also make changing design solutions a potentially major problem. For example, changing a roofing system (e.g., shingle to red tile or structural standing seam) may also require redesigning the structural system to support added weight.

Because redesign is so costly and time consuming, the engineer will generally modify or rescope the original design rather than investigate a totally different solution to client desires. It is generally accepted that design decisions made early--usually prior to the 10% design stage --control 80% to 90% of the costs of the construction (50). The traditional design cost estimating procedures focus on assessing costs <u>after</u> design decisions are made and conveyed to construction drawings and do not allow costs to influence design decisions. This approach unnecessarily

restricts the active influence of cost decisions in the design alternatives of construction projects. A weakness of traditional design cost methods is that cost evaluations of design decisions are not integrated into the planning process. Johnson has argued that a weakness of design theory is that it does not consider the implications of decision theory nor offer a mechanism to allow selection of choices and investigation of trade-offs (51).

## Statement of the Problem

Construction costs have traditionally been estimated using one of two methods: (1) comparative estimates and (2) engineering-build-up/quantity-take-off (QTO). Comparative estimates are used most often in the early stages by the owner or developer while the QTO method is used by the designer/engineer and contractor during design and construction stages. While both methods are useful, there are inherent limitations in the processes of, one, collecting valid historic data for comparative estimates and, two, the applicability of the QTO method in the early predesign planning stages when design drawings are incomplete.

Comparative estimating. Comparative cost estimating is a form of parametric estimating: a group of methods that use some form of historic cost data from which a new estimate is derived by comparing a current project to past projects--thus, the term comparative. Comparative estimates include unit costs, square foot costs, and parametric

estimates derived from historic cost curves. A major problem in developing comparative estimates is that there is no standard method of defining the technical or descriptive characteristics of individual facilities or collecting historical costs associated with the characteristics. Specifically, comparative cost data are often collected for the total cost of a building in terms of cost per square foot, without necessary descriptive information on unique characteristics or special components. For example, total costs for different dormitory projects are summed and averaged for unit costs with minimal or no distinction among design types, number of stories, or even if the dormitory has a high-cost red tile roof for architectural compatibility or low-cost shingle roof. This problem is exacerbated when total costs are averaged across differing local building codes, construction methods, or state/local procurement laws and practices. Data collection services (34, 56, 62, 76, and 82) expend a lot of effort to "normalize" these data to a common base and thereby account for the differences. However, if the original data are not collected with these unique characteristics spelled out, no amount of statistical manipulation or regression analyses can account for the differences with reliability or validity. Finally, an unsolvable problem in comparative estimating is if the project is a new or one-of-a-kind facility, i.e., there is no cost history or data on this specific type of facility, there can be no valid comparative estimates.

Quantity-take-off estimating. Quantity-take-off estimating is a process of counting every component of a design to the lowest level of detail. The term literally comes from counting (measuring the quantities of) material from detailed design (take-off from the drawings). Cost data for these estimates are generally collected from suppliers of bids from subcontractors for materials and installation methods specified in the design. A problem inherent in QTO methods is caused by the sheer number of calculations and measurements required in counting every component of a complex facility. Errors of omission and commission are constant problems. For example, in one complex project, there were 278 cost change orders--over 250 were due to errors and omissions of the architect/engineer cost estimate (77).

While cost data collected for QTO estimates are generally reliable because all materials are costed, information necessary to provide quantity estimates is not available until the design is near completion. Unfortunately, it is in the early stages of design and even earlier stages of planning, that cost management is most critical. By definition of the method, the problems in the predesign stages cannot be solved with QTO methods.

Although the above problems exist, the allocation of budgets could change based on decisions made during the early planning stages of a project. Some current concepts in the Space Defense Initiative (SDI) Program, for example, must include construction cost decisions, even though the actual construction may not take place for decades.

Proposed solution. There is a need for a cost management tool to accurately cost and support the analyses of early design decisions without the accompanying cost of detailed design and drawings--as in quantity-take-off estimating. But, these early feasibility and cost decisions should be based on accepted engineering practices--not historical data files--as in comparative estimating. This study is to develop a knowledge-based system that will translate project requirements through accepted engineering solutions to material, labor, and equipment quantities and price these against current cost data to help analyze costs of design decisions for construction projects.

> A knowledge-based expert system is a computer program that uses knowledge obtained from experienced practitioners {experts} in a specific domain to assist others {users} in solving complex problems at expert levels of competence [21]. Expert systems are most appropriate when the solution to the problem is not {totally} algorithmic but requires {at least partially} judgmental knowledge. (15:9)

This knowledge-based system would not take the place of the architect/engineer but could permit them to model the interrelated design decisions very early in the planning stages. This knowledge-based system should be oriented to costing and analyzing project definition and design solution decisions. The target users would be clients (owners or future occupants of a facility), developers, or investment agencies (lending institutions or monetary backers) who need good information for design decisions or

feasibility and economic studies. The engineer or architect could use the knowledge-based system to help elicit project definition requirements and communicate to the client the cost impact of their desires. Sometimes the client's wants are relatively arbitrary--until surprised with the associated costs! A knowledge-based system is needed to help avoid cost surprises and cost overruns.

This knowledge-based system would also provide a "true" value engineering tool. If alternative design solutions could accurately and quickly be analyzed without the time and man-hours currently required with detailed design, it would be a true breakthrough in value engineering for construction projects. Once the definition (design alternatives) for each building system is analyzed and chosen from the extensive knowledge base of design solutions, the now project-specific model could provide a cost management tool to monitor detailed design, evaluate bids, and analyze change orders. A knowledge-based system for predesign cost estimates of construction projects can provide the modeling capability to support these project decisions and construction management analyses.

The primary focus of this study is the development of a process that enhances the construction planner's ability to clarify the decisions and tasks and isolate the preferred course of design based on both engineering and cost decisions.

## Objectives

The objectives of this study are to develop a knowledge-based system for decision making in construction projects and demonstrate a private sector application of the system in the cost-modeling process. The basic thesis is that modeling techniques can be developed to relate construction project requirements to current cost data through accepted engineering practices in order to develop better early cost estimates for initial budgets and feasibility decisions--without detailed design documents. This knowledge-based system will be used for predesign estimates, resource allocation, and analyses of construction alternatives in the earliest stages of project planning. This will provide the owner, developer, and/or engineer with the cost tools to manage and control the costs of the construction project through the often confused stages of planning, budgeting, financing, and value engineering. The modeling concept will use a knowledge-based system to integrate expert judgments, engineering criteria, safety codes, historical data, descriptive factors, and specific market and site information. The integration should provide unprecedented reliability and validity to construction estimating resulting in significant improvements in accuracy and reduction in estimating man-hours to provide the owner, developer, or engineer cost information during the critical decision stages of project feasibility and construction planning.

This approach will result in budget estimates that are as accurate as the best traditional quantity-take-off estimates that are developed during the design development process because both use current cost data. It will overcome the errors of omission and commission commonly found in traditional estimates and will be more accurate than other conceptual estimating techniques that use CERs (Cost Estimating Relationships) based on historical data. This approach will cost less and be more timely for decision making than traditional quantity-take-off design estimating because detailed design of the current project is not required to support the decision process. Because it will be a knowledge-based computer model rather than design-based estimating, this approach will support better decision making early in the budgeting process by allowing rapid "what if" analyses and analyses of alternative engineering solutions to meet project requirements with cost considerations as part of the decision.

## Research Scope

This study concentrates on the development of a knowledge-based system approach for decision making in civil engineering, construction management, and cost estimating aspects of construction projects. The software platform for implementing the results of this study into a usable tool is the Construction Cost Management Analysis System (75) developed by the author for the U.S. Air Force.

The Construction Cost Management System is a collection of tools and methods including a traditional parametric comparative estimating system; handbooks for area adjustments, escalation factors, and size adjustments; a runway taxiway model for costing the beddown of squadrons of aircraft; and two generic building models. The building model section of the Construction Cost Management System includes a generic model for an administrative facility and medical facility with predefined fixed building systems based on Air Force criteria and past military projects.

This study is expected to produce new expert systems techniques that will allow cross-applicability in modeling either military or private sector construction projects. This cross-applicability is based on the thesis that general project requirements can be modeled using expert systems technology to generate material, labor, and equipment quantities and cost these against current cost data. The expert system will model accepted engineering practices as a combination of engineering algorithms, heuristics, criteria, and data. This study will use a private sector case study to demonstrate the cross-applicability from the original military fixed modeling system to the private sector. These techniques will support the development of better early cost estimates for initial budgets and feasibility studies--without detailed design documents.

This research will be accomplished in three phases that are described in Chapters 3, 4, and 5.

Chapter 3 describes the artificial intelligence and expert systems methods and procedures used in this study. The measures of merit for comparing the results of this study with traditional construction cost estimating methods are discussed in this chapter.

Chapter 4 will present the development of the knowledge acquisition, design of the knowledge bases, and creation of the model design. The Construction Cost Management Analysis System (75) will be used as the software inference engine to exercise the new modeling techniques. All other methodologies and analyses, including developing the private sector cost parameters for the case study, will be a new design and development under this study. The cost data will be drawn from a national unit price book (82). The specific inference engine and unit price book were chosen because they are public domain systems and, therefore, do not require special or proprietary permissions and are not cost prohibitive for use in research. Outputs from this phase will be a model design and methodology description.

Chapter 5 will report a case study, a specific application, of the modeling techniques on a private sector project. Comparative analyses of accuracies with model results versus results provided by traditional methods will be conducted. Accuracies will be measured by comparing the forecast construction costs from the knowledge-based estimating methods with the construction contractor payment schedule on the project.

Analyses of model results, based on the measures of merit from Chapter 3, will be discussed in Chapter 6. These analyses of results will include additional comparative analyses of estimating accuracy on projects that are fiscally complete to ensure all design errors and omissions and/or change orders are included in the close-out costs. Outputs from this phase will be comparisons of estimating accuracy of the knowledge-based system to traditional budget estimating. Conclusions will be drawn from the model design, analyses, and resulting accuracies and reported in Chapter 6.

Chapter 7 will provide suggestions for future research in the development of this technology.

# CHAPTER 2
# REVIEW OF RESEARCH LITERATURE

## General

Extensive literature exists on the general subjects of cost estimating and cost analysis (e.g., 3a-f, 4a-d, 5a-f, 6a-d, 7, 8a-b, 9a-d). Several professional societies (e.g., American Association of Cost Engineers, International Society of Parametric Analysts, and Society of Cost Estimating and Analysis) set their charters around the advancement, training and regulation of cost control, cost analysis, and/or cost estimating. Even as one narrows the subject to specific areas of methodology such as parametric estimating or "engineering buildup" (known as "quantity-take-off estimating" in construction engineering), the volume of articles remains very large but expands to greater depths of detail. Greater detail, however, does not give new or different methods but more microscopic inspection of existing methods. Likewise, as one narrows the subject to specific areas of application, such as construction engineering, one must consider the need to investigate diverse areas of emerging sciences, such as expert systems, for potential use. In other words, there is no simple way to narrow the literature search for research in cost estimating for construction engineering.

Three of the numerous broad areas of methodology have application to this dissertation. These three will be discussed for their relevance to this research. They are:

a. Methods of estimating and accuracy at different stages of construction.

b. Parametric estimating systems.

c. Expert systems.

In the search, three special interest cost systems were found that, at first glance, could appear to have similar breakthroughs as this research proposes. Each of these items will be described with specific discussions on the methodological differences between them and this proposed study. These three are:

a. "Sara Systems" by SARANET, Las Cruces, NM (88).

b. "Control Estimate Generator (CEG)" by the U.S. Army Corps of Engineers (80).

c. "A New Forecasting Methodology for Contingent Situations (Building Cost Estimations)" by Ohara et al. (62) and Yokoyama and Tomiya (4a).

## Literature Sources

This literature search included multiple texts on construction estimating and numerous published articles. The University of Florida library system, particularly the Architecture and Fine Arts Branch and the Marston Science Library, were valuable sources of current literature. For

literature more specifically related to military applications, the Defense Technical Information Center (DTIC) was invaluable. A DTIC Interlibrary Information Network located at Tyndall Air Force Base, Florida, enhanced the timely access to all aspects of military research in the subject area and related areas. A "key word search" capability unique to DTIC opened multiple related research areas that otherwise would not have been known. For example, key words of "artificial intelligence," "expert systems," and "construction" allowed one to scan abstracts of published articles relating to all three subjects. If the three combined subjects made the resulting list of abstracts too limited, a simple on-line deletion of the key word "construction" while keeping the key words "artificial intelligence and expert systems" broadened the coverage immediately, allowing the researcher to investigate other research areas, some only remotely related. This key word search opened vast opportunities of related research, but at the same time, saved many man-hours of "paper shuffling" by focusing the literature that had potential application to the proposed subject.

In addition to the search of published information, a written request for information was sent to a variety of major U.S. construction related industries to seek yet unpublished breakthroughs in this area of research. The letter also questioned their willingness to use a knowledge-based modeling approach as proposed in this research.

A patent search, through the U.S. Patent Office, Washington DC, was conducted to determine any patents or pending patent applications for engineering designs relevant to this research.

## Published Information

### Methods of Estimating and Accuracy

Almost all text references began with a classification of methods of estimating and by relating these methods to different stages of construction. Hardie used "two broad titles: approximate estimates and detailed estimates (43:19), where the approximate estimates are used in early stages by the owners and the detailed estimates in the construction stages by the contractors. Sinclair divides the types into "Conceptual estimates," "Preliminary estimates," and "Final Design/bid estimates" (68:1-4).

Bentil uses three general categories: Conceptual, Semidetailed, and Detailed. He breaks conceptual estimates into order-of-magnitude, parametric or cost indexes. Bentil states "the accuracy range of these (conceptual) estimates is usually within 20%." (19:33) In his semidetailed category, he places design development, budget estimates, or systems estimates. He says "even though the accuracy level of these estimates is low {but he does not define low}, they are more definitive and accurate than conceptual estimates." (19:41) Bid estimates and unit price estimates fall in his category of detailed estimates.

He states "detailed estimates are comprehensive and based on '100% completed' contract documents (plans and specifications)." (19:41)

Clark defines three types which he calls: "planning, evaluating stage--screening estimates, budget stage--basic-design estimates and detailed engineering/construction stage--definitive estimates.' (27:23)

All the references placed the quality of conceptual or predesign type estimates in the range between 20% to 50% inaccuracy (19, 27, and 31). Semidetailed or parametric estimates reduced the inaccuracy of the estimates to ranges of 15% to 20% (27). Inaccuracies similar to these of the proposed model (3% to 10%) could not be obtained until detailed design data were available, and then only if the quantity estimate was free of errors and omissions.

## Parametric Estimating Systems

Most of the literature on parametric estimating techniques is found in applications to production line or repetitive processing type industries. Martino uses a definition from the Dictionary of the National Estimating Society (NES) which defines parametric estimating as "a technique which employs one or more cost estimating relationships for the measurement of costs associated with the development, manufacture, or modification of a specified

end item based on its technical, physical, or other characteristics." (55:1) All of the references used some form of regression analyses and factor analyses to develop their parameters from historic cost data (3a:B-1, 8b:C-2, 9c:B-5, 17, and 47). Hayes expresses the pitfall of traditional parametric techniques by stating "statistics is a valuable tool, but one should never get so overwhelmed with statistical methods as to be blind to his basic engineering or other professional knowledge." (9c:B-5)

The proposed concept avoids this pitfall by using knowledge-base manipulation of engineering and professional experiences. No reference used the concepts suggested in this proposal.

## Expert Systems

Expert Systems are being investigated for application in all areas of construction management. In 1986, Rounds noted that "some future problems in the realm of cost engineering that would be good prospects for Knowledge-Based Expert Systems (KBES) development might include the following: . . . Conceptual estimating, parametric estimating, historical cost data management. . . ." (6d:H-5) The Air Force Cost Center investigated "off-the-shelf" shell expert systems for cost forecasting applications (2).

Arditi provided the following definition and assessment:

> A KBES consists of a knowledge base that stores data and decision rules regarding a particular problem, and an inference engine that manipulates the information in the knowledge base in order to reach a decision. It may also make use of data generated by an external source called an "information base." . . . Construction management appears to be an appropriate domain for applying the emerging artificial intelligence technology because [22]:
>
> > construction is an experience-based industry;
> >
> > construction decisions must be made quickly; and
> >
> > construction decisions involve managerial issues (15).

Gregory developed an expert system application using "The Intelligent Machine Model" (an expert system shell available through GRC Corporation) for assessing "Programmatic Risk for Facilities--An Expert System." Gregory reported over a dozen current, expert system applications in construction management (41 and 42). All the references, except Sara Systems, which will be discussed in the next section, used off-the-shelf, commercially available shells. With the applications of expert system shells expanding rapidly, the acceptance of the use of knowledge-based systems will also expand.

## Industry Responses

In addition to the search of published information, a written request for information was sent to a variety of major U.S. construction related industries to seek unpublished breakthroughs in this area of research and to ascertain their willingness to use modeling techniques proposed in this research (78a-o). This survey provided responses that were overwhelmingly supportive of the proposed modeling concepts. Excerpts of selected responses include:

> ALCOA: Your system (concept) is very powerful and versatile. . . . Application from conceptual stage to final design. . . . Your estimates should be more accurate than those to which we are accustomed. (78c) (ALCOA acts as a private sector contractor with major construction projects all over the world.)

> THE BENHAM GROUP: We support your efforts to develop the parametric estimating program to be used to establish viable budgets for projects . . . to preclude the necessity of the 35% design effort prior to funding. (78d) (The Benham group is a private sector architectural/ engineering design firm that does construction design and management worldwide.)

> CRS SIRRINE: I am pleased to document the professional views of CRS SIRRINE about the role and viability of parametric estimating in the development of proper, verifiable, and defensible project budgets, particularly where design and detail are still incomplete. . . . The Government in particular, not just DoD but all construction agencies, can benefit from this improved technique. . . . (78f) (CRS Sirrine is one of the largest construction companies in the U.S. and provides construction services all over the world.)

## U.S. Patent Search

Because this research focuses on the design of an engineering-based parametric model, a literature review was conducted at the U.S. Patent and Trademark Office. In the field of Expert Knowledge Systems, computer subclass titled "Artificial Intelligence," several patents were of interest. All excerpts found in the subject area were shell systems. Shell based systems model logic rules that can be applied to differing knowledge bases.

In Patent No. 4,847,784, "Knowledge Based Tutor," Clancey gives an excellent summary of the past art in developing expert system shells (86a).

In Patent No. 4,970,657, "Expert Knowledge System Development Tool," Wolf produces an expert system shell by using an inference engine inferring from a knowledge base. It includes an apparatus and method for inferring hypotheses by providing an expert knowledge system development tool comprising a computer with a structure for storing a knowledge base and an inference engine structure for inferring from the knowledge base. From this knowledge base, true/false values are obtained and used to forward chain through the rules in order to obtain a conclusion and backward chain in order to enhance the inferring process (86b).

In Patent No. 4,967,368, "Expert System with Knowledge Base Having Term Definition Hierarchy," Bolling et al. also describes an expert system shell. This shell is

related to digital data processing and expert system shells employed in digital data processing systems. Definitions are used instead of rules. The inference engine determines what decision the expert would have made regarding a given term by computing the term's value from its definition. If the definition involves other terms, the values of those terms are computed from their definitions (86c).

In Patent No. 4,989,162, "Method of Using an Accuracy Valve in a Conflict Resolution of a Forward Inference," Tanaka and Nakamura describe a method to build an expert system shell. This art is designed to provide an interrogating device of a type which can quickly give a conclusion of a high probability by adding an accuracy to the fact and rule for permitting the forward inference control system to perform the uncertain inference (86d).

In the more general subject field of computer-based modeling for construction, U.S. patents of interest include No. 4,700,218 to Okman which discloses a computer system for construction projects such as buildings, dams, bridges, industrial plants, means of transport, and the like (86e).

In the Thompson Patent No. 4,642,780, a computer system is used in fields such as architecture, space planning, interior design, and corporate facility management for efficiently designing and allocating space to the various subdivisions of an organization (86f).

In Patent No. 4,782,448, Milstein uses a computer as an aid in contract estimating (86g).

Racine, in Patent No. 4,578,768, describes a computer aided system used in construction planning, land surveying, real estate, and many other industries (86h).

Aish, in Patent No. 4.274,449, mentions a Computer Aided Architectural Design (CADD) system (86i).

Cox, et al., in Patent No. 3,927,948 discuss a method and apparatus for designing structures such as industrial plants (86j).

None of the above referenced patents provide a knowledge-based systems approach for modeling an engineering-based, parametric cost estimating system for decision making in construction projects. The U.S. Patent Office has verified this assertion through the Air Force Judge Advocate General, Patent Prosecution Office.

## Special Interest Items

### "Sara Systems"

"Sara Systems" is advertised as a true Artificial Intelligence system for architectural programming that is linked to cost estimating and scheduling systems. It was developed by Fred Waid, et al., with SARANET, Inc., Las Cruces, NM (88). An off-the-shelf shell was not used for this expert system. The inference engine was designed and programmed by the developers and has the ability to train itself as new projects are evaluated. No published information has been made available. All information was

gleaned from demonstrations and interviews with Mr Waid. "Sara Systems" is a computer-based architectural programming tool for configuration layout that uses a spread sheet approach for manipulating comparative cost estimating relationships (CERs) for predesign estimates and analyses of construction projects. Waid agrees that the approach is entirely different but may be complementary.

"Control Estimate Generator (CEG)"

The "Control Estimate Generator (CEG)" developed and used by the U.S. Army Corps of Engineers (80) is the second system of special interest. The main difference between the proposed approach and CEG is that CEG uses a "bottoms-up" approach that scales up or down one existing facility design to produce a list of quantity-take-off line items. The proposed study uses a "top-down" approach where the path can change and select different components based on differing design criteria to model the specific conditions and design. The "top-down" approach allows an estimator to cost unlimited numbers of possible and truly different designs. The "bottoms-up" approach limits the estimator to adjusting the same design within engineering limits. The CEG construction assemblies are based on gross floor area and factored for different square footages for the same design. This study proposes to store assemblies by construction methods that can be used with expert knowledge in any applicable design. Using the

"bottom-up" aggregation and the square footage factoring on the assemblies, prohibits the development of functional space knowledge bases. The latter is the real breakthrough anticipated in the proposed approach.

"<u>A New Forecasting Methodology for Contingent Situations (Building Cost Estimations)</u>"

"A New Forecasting Methodology for Contingent Situations (Building Cost Estimations)" by Ohara, Yokoyama, et al. (62 and 4a) uses a "fuzzy framework" (20 and 54) methodology to incorporate probabilistic, nonprobabilistic, and contingency factors in construction estimates. The nonprobabilistic factors include incidental (predictable) and accidental (unpredictable) factors. Table 2-1 gives property definitions and some examples of their uncertainty factors. This methodology which introduces a new method to develop construction cost estimating relationships (CERs) is an improvement over traditional factor analyses. It is still, however, a method of developing CERs from historical projects costs. As quoted by Yokoyama, "first we calculate the Mc (mean cost) of a standard building. Next we select special features from the tables of various building conditions." (4a:B-6) This approach is in no way similar to the proposed approach.

Table 2-1
UNCERTAINTY & FORECASTING
BASIC CATEGORY OF UNCERTAINTY (62)

| Ruling Factor | Property | Examples of Phenomenon |
|---|---|---|
| Probabilistic Factor | a) Happenings under probability rules | Sale-up design, product defective ratio, mass production cost, model change, technical improvement |
| Non-Probabilistic | b) Incidental happenings (high-frequency) Rather predictable | Cabinet reshuffle, harvest, weather, innovation, boom, depression, currency exchange rate |
| | c) Accidental Happenings (very rare unpredictable) | Wars, catastrophy, earthquake, flood, Black Monday, oil crisis, revolution, invention of super-technology |
| Contingent Factor | d) [a]+[b] Probabilistic Incidental happenings and predictable | Economic fundamentals, strategy, consumer's behavior market stock price, corporate performance, R&D, project cost estimations, investment risks |

## Conclusions from Literature Review

Although several sources discuss parametric estimating, these sources use techniques to statistically analyze historical data. None of the parametric estimating literature discusses the ability to parametrically forecast never-before-built facilities. None of the existing literature claims to predict construction estimates at the predesign stage with sufficient accuracy for project definition decisions or engineering solutions evaluations. The expert systems literature discusses applications of decision shells. The only relationship to cost estimating is the ability for some expert systems shells to accept or transfer data to spread-sheet (or other specialized programs) for elementary mathematical calculations. A U.S. patent search indicated no past or ongoing developments in knowledge engineering related to the proposed research. Surveys of related industries construction confirmed the need for the development of a cost model for predesign estimates of construction facilities. Thus, the literature search revealed no similar research and reaffirms the need for the proposed research.

# CHAPTER 3
# METHODS AND PROCEDURES

## Introduction

The need for Artificial Intelligence and Expert Systems is expanding at an unprecedented rate. "It is said that one issue of 'The New York Times' contains as much information as a sixteenth-century person had to deal with in a lifetime" (45:1). The information explosion and the rapid communication systems of today and tomorrow require near immediate synthesis of data and expert knowledge to solve complex technical problems. Construction engineering is no exception to the information explosion. New materials; computerized control systems; voluminous legal, regulatory, and safety requirements; and construction technologies are just a few examples of the rapidly expanding information fields that the construction engineering must synthesize today.

The evolution of expert systems is shown in Figure 3-1 (44:3). Although Figure 3-1 has components of Artificial Intelligence graphically displayed in discrete boxes, the set of tools could be more accurately described as a continuum of emerging tools with overlapping applications. This study concentrates on those Artificial Intelligence

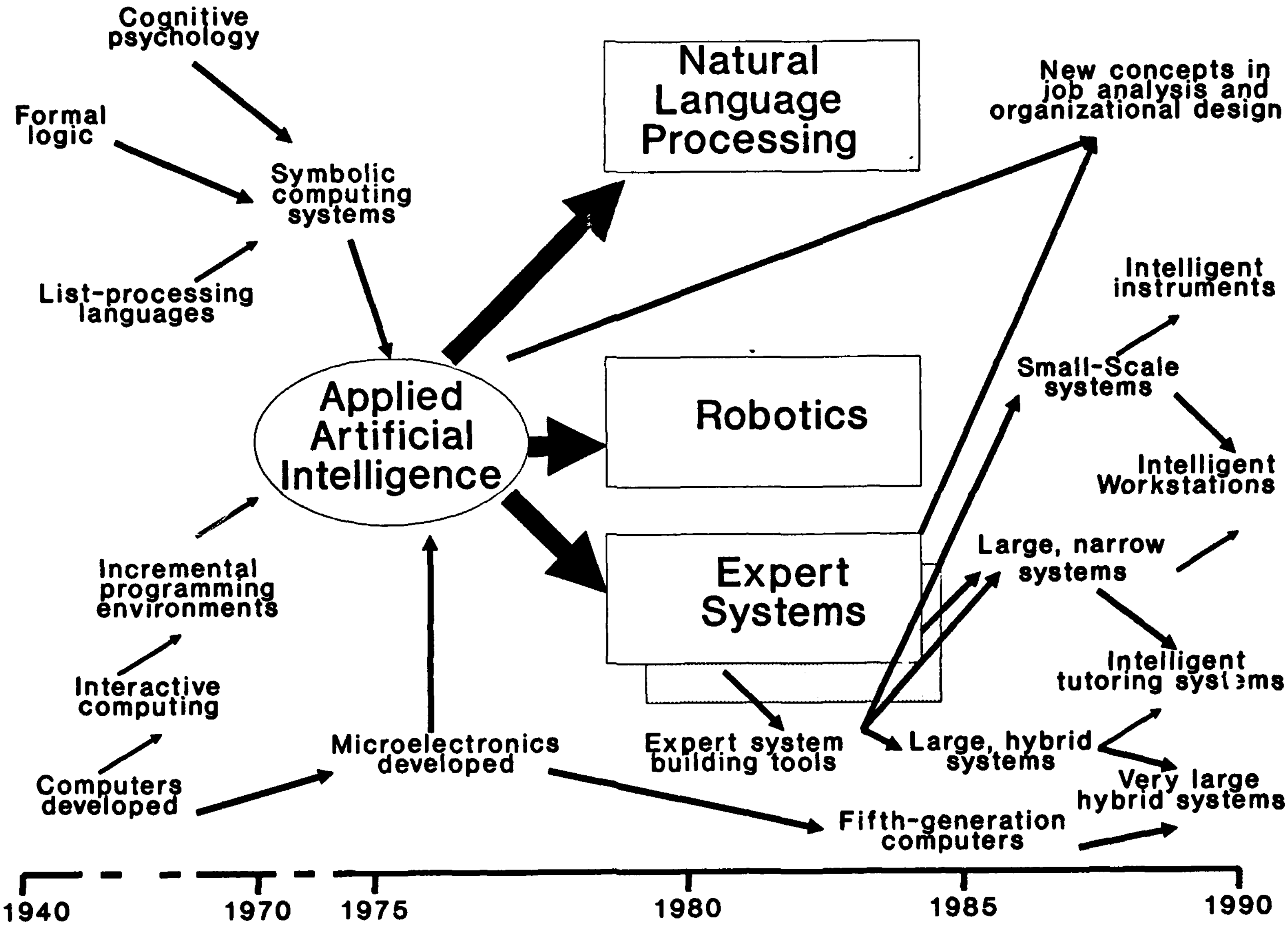


Figure 3-1. The Evolution of Expert Systems
(44:3 used with permission)

tools designed to enable computers to assist experts in analyzing and solving complex problems--expert systems. The modeling system designed for this study is a knowledge-based expert system approach for decision making in construction projects. This expert system uses parametric engineering techniques with a finite field of both codified and unstructured data elements in a unique process which can provide construction (material, labor, and equipment quantities) cost estimates without detailed plans and specifications.

## Background/Theory

Artificial Intelligence is an "academic research program" (45:4). The five most active areas of commercial applications using Artificial Intelligence research are:

Natural Language. A focus on using a language which humans speak (e.g., French or English) as a front-end to convert the manager's typed or spoken request into a set of data base query commands to obtain information from a data base program (45:4-5).

Robotics. Those computer programs that allow devices to see and manipulate objects with which they interact (45:4-5).

Improved human interfaces. The use of psychological and programming techniques to develop "user friendly" Interfaces similar to those on the Macintosh computers (45:4-5).

Exploratory programming. Research to develop large applications including new computer languages, programming environments, modularity, incremental developments, and "automatic programming" (45:4-5).

Expert Systems. A program that manifests some combination of concepts, procedures, and techniques to allow people to design and develop computer systems that use knowledge and inference techniques to analyze and solve problems (45:4-5).

The three main ideas that distinguish an expert system from other applications of Artificial Intelligence are the "representation of knowledge, heuristic search, and the separation of knowledge from inference and control." (44:7) Figure 3-2 is a block diagram of an expert system. Harmon, et al., (44 and 45) define the components as follows:

Knowledge. An integrated collection of facts and relationships which, when exercised, produces competent performance. Experiential knowledge or working memory is knowledge gained from hands-on experience. This typically consists of specific facts and rules-of-thumb (subsurface knowledge). This is in contrast to deep knowledge of formal principles or theories.

Inference engine. That portion of an expert system that contains the inference and control strategies. More broadly, the inference engine also includes various

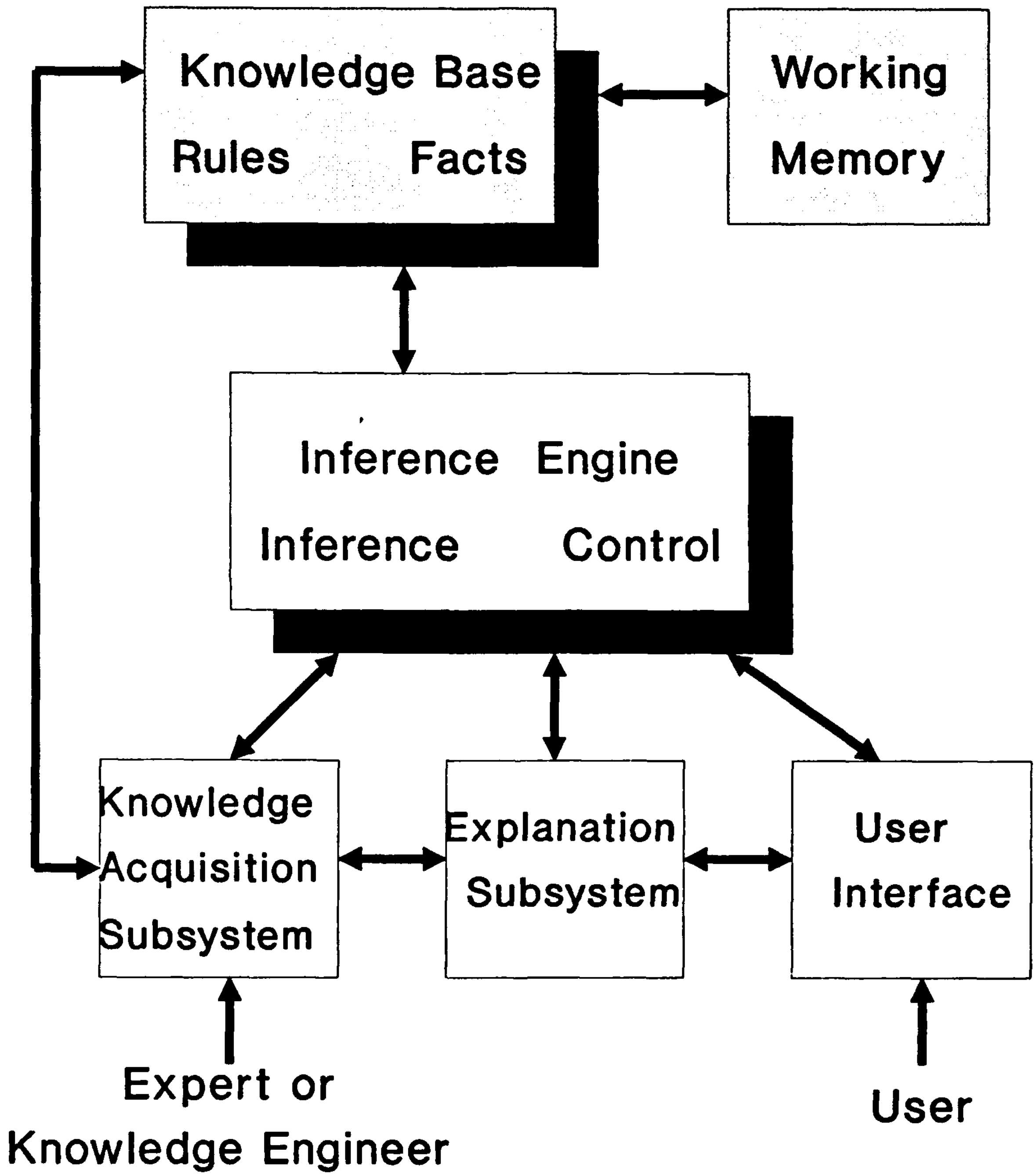


Figure 3-2. Expert Systems (44:34 used with permission)

knowledge acquisition, explanation, and user-interface subsystems. When an inference engine is separated from a knowledge base, it is in effect, an expert system building tool.

Knowledge acquisition subsystem. The process of locating, collecting, and refining knowledge. This may require interviews with experts, research in libraries, or introspection. The person undertaking knowledge acquisition, called a knowledge engineer, must convert acquired knowledge into a form that can be used by a computer program.

Explanation subsystem. In expert systems, explanation refers to a number of techniques that help a user understand what a system is doing. Many knowledge systems allow a user to ask "why," "how," or "explain." In each case the system responds by telling the user something about its assumptions or inner reasoning.

User interface. The software that links the computer program and the user exercising the expert system or the expert "programming" his expertise. Expertise is defined as the skill and knowledge that some humans possess that result in performance far above the norm. Expertise often consists of massive amounts of factual information coupled with rules-of-thumb, simplifications, rare facts, and wise procedures all compiled in a way that allows the expert to analyze specific types of problems in an efficient manner (44 and 45).

Knowledge is differentiated from data in the organization of facts and the ability to draw on organized data to make decisions. Both knowledge bases and traditional data bases are designed to store information. They differ significantly from each other in the types of information they store, and the types of interrelationships between data they handle (14). Expert systems look to programming the "logic" of knowledge, capturing the concepts, and the techniques of problem solving as compared to traditional computer programming techniques solving mathematical problems.

Heuristic search refers to techniques usually acquired from experience versus theory. Heuristics are commonly called "rules-of-thumb." An important issue that is often downplayed by the proponents of Artificial Intelligence is that heuristics do not guarantee the correct answer. In fact, heuristics are quite situational and can lead to errors. An even greater problem to traditional civil engineering applications is that heuristic approaches do not give the same results every time they run through an expert system or are used in daily life. Civil engineers, accustomed to working with proven equations and handbooks of factual data, tend to look more to deterministic solutions and may refuse to use even a "good" expert system, if the results are not presented within the acceptable limits of consistency of their cultural domain. Although a good construction engineer will value multiple "seat-of-the-pants" decisions from an expert, seeing similar mixed

results from heuristics in a computer program may cause him to distrust the computer program! This issue alone may severely limit the acceptance of expert systems in civil engineering applications. The expert system designed for this study overcomes this pitfall by using predefined, construction knowledge bases manipulated in a formal hierarchial work breakdown structure.

The third key point that distinguishes an expert system is separation of knowledge from inference and control. This separation allows the expert to review the data/knowledge and pinpoint the exact rules or procedures that manipulate the knowledge. It alleviates the black box perception of conventional computer programming. This separation also allows the nonprogrammer to become a programmer by allowing him to program a completely new body of knowledge and in essence develop his own algorithm (45:8). This separation of knowledge from inference and control is the main power behind the future of expert system applications by allowing unlimited applications of proven inference engines to various knowledge bases.

Artificial Intelligence and expert systems, although powerful tools that promise to revolutionize the use of computers, are not panaceas. They do not replace conventional applications of computer programming and algorithmic solutions to engineering problems. The key in selecting conventional programming versus expert system programming is properly describing the problem that requires solution.

If a conventional program can be used to solve a problem, then it is probably better to use a conventional approach. However, there is a rapidly growing field of applications called "hybrid tools" that use expert systems as front-end input control systems for complex conventional programs or some other integrated application of new and conventional techniques. The expert system designed for this study uses a hybrid of structured heuristics and conventional engineering algorithms to develop detailed material, labor, and equipment quantities from input data that may be limited to type facility, gross square feet, and geographic location.

## Expert Systems Types

Expert system tools are commonly categorized into the five types shown in Figure 3-3. Inductive tools generate rules from examples. They are usually dependent on a large number of examples for the machine's information base. Simple rule-based tools use if-then rules to represent knowledge. They can be based on forward chaining or backward chaining strategies. Structured rule-based tools add context trees, multiple instantiation, confidence factors, and other powerful complements to simple rule-based systems. Hybrid tools represent the most complex set of expert systems. They are characterized by new computer languages or hardware such as LISP, a programming language based on list processing. Hybrid tools usually integrate conventional computer programs, spread sheets, data bases,

- INDUCTIVE RULES
- SIMPLE RULE BASED TOOLS
- STRUCTURED RULE BASED TOOLS
- ✓ HYBRID TOOLS
- DOMAIN SPECIFIC TOOLS

Figure 3-3. Expert System Types (44 and 45)

- PROCEDURES
- DIAGNOSTIC
- MONITORING
- ✓ CONFIGURATION/DESIGN
- SCHEDULING

Figure 3-4. Problem Categories (44 and 45)

or graphics packages with expert system programming. Domain specific tools are designed for a particular application. Domain specific applications can be any combination of the above types.

The choice of the right tool to support problem solving is primarily dependent on the type problem to be solved. Artificial Intelligence researchers and knowledge engineers categorize the strategies and methods people use to solve problems into the general categories listed in Figure 3-4. Procedures tell a computer system what to do, for example: multiply A times B and add C. Conventional programming is very effective at modeling procedural data manipulations. Expert systems add methods to model procedural logic. Conventional programming is the better tool for most procedural applications when data manipulation is the goal. Diagnostic systems analyze data to recommend an action. Most current commercial applications of expert systems are diagnostic applications. Monitoring systems are designed to cycle through and keep track of control data sources from some activity until the feedback indicates something is wrong. A signal is processed (e.g., an alarm is sounded) or corrective action initiated at this point. Configuration/Design systems establish an acceptable way or base line of component integration, then monitor changes to keep the resulting configuration within acceptable constraints or limits. Scheduling systems arrange the sequence of steps and operations of a process

to determine the path followed to reach a goal. Planning systems consider the planning and design of a process to include legal, budgetary, and other management constraints that should be considered to reach a goal.

## Study Procedures

Expert systems can be a valuable tool for construction engineers. The complexity and interrelationships required to produce a detailed engineering cost estimate for a complex construction project require a hybrid expert system to best model the complexities and must be capable of reflecting configuration/design problems. Note the checkmarks on Figures 3-3 and 3-4. Construction cost engineering problems that can be supported by expert systems are probably more complex than first assessments indicate. Therefore, prototyping before full acceptance in the industry is desired. The Parametric Building Cost Estimate Generator (75), designed for this study is discussed in the next chapter. It is a complex, hybrid expert system building tool for developing a prototype for configuration/design problems in construction cost engineering. The model design, knowledge bases, work breakdown structure, functional space areas, system algorithms, and procedures for exercising the expert system will be described. The application of the expert system in a specific case study will be discussed in following chapters. Additional analyses will be provided to demonstrate study

results and compare results of the proposed parametric approach to traditional construction cost methods. Three measures of merit will be addressed: Accuracy and specificity; time/timeliness; and user friendliness.

Accuracy. There is no industry-wide standard for acceptable levels of cost accuracy on construction projects. To establish a threshold of "acceptable accuracy," this study proposes to adopt the "management flex" of plus 20% or $1.5 million allowed by the U.S. Congress for Department of Defense Military Construction Appropriations. Although this "management flex" only addresses the positive error side (equal to underestimating or "busting") of the appropriated amount, the military departments are similarly concerned about the underside (over-estimating or "leaving money on the table!") because over estimating uses portions of their Total Obligation Authority (TOA) that could be used for other projects. Similar problems of budgetary allocations exist in the private sector, although not as formalized and standardized as military construction line-item authorizations and appropriations. A measure of "goodness" is plus or minus 20% from actual costs.

For case study comparisons, this study proposes to compare the absolute value of the percentage difference of the expert systems model results to the actual fiscal close-out cost of the projects computed with traditional quantity-take-off methods. The proposed measure of merit

is the simple average of the absolute value of the individual case comparisons when making multiple project comparisons.

Specificity. The most important part of the accuracy measure is to be able to specify and explain why, in engineering parameters, the estimate differs from the actual costs. Traditional parametric comparative systems using only Cost Estimating Relationships (CERs) do not provide specific engineering information to support analyses of causal effects of differences.

Time/timeliness. The time/timeliness measure of merit is more subjective in nature. At first inspection, one would assume that estimating methods could be compared by measuring the time to estimate a project with traditional methods versus the time required to run a knowledge-based systems model. It is not easy to establish a realistic time with either method.

In traditional quantity estimating, the components are priced as design drawings are completed. Designs and estimates of major subsystems or portions, such as mechanical or electrical, are often subcontracted. As a result, there is no definitive start/stop time interval to measure time.

Another intuitive measure would be to sum time sheets. This too loses meaning in commonly accepted construction practices. Estimating is more often charged as a percent of project design/cost, independent of time sheets.

With a knowledge-based system model, the dilemma in measuring time is how to prorate the time to develop and maintain the knowledge bases over many applications. It would be unfair to charge the few seconds to run the model as the only time to estimate a project.

The advantages of time/timeliness will be measured in the case study. It is anticipated that very few engineering parameters (only type of facility, gross square feet, and location) will be required to fire (exercise the combination of rules, knowledge bases, and data bases) the knowledge-based inference engine for most construction projects. Thus, for these cases, the only time requirement is running the model. However, for unique requirements in facilities that have never been built before, eliciting knowledge and additional engineering parameters from the client may be a repetitive process. This repetitive process can be analogous to redesign process but without the high cost of reengineering or redrawing. Thus, for this study, time/timeliness measure of merit will be discussed on a comparative basis, not finitely measured.

User friendliness. The third measure of merit is concerned with advantages of an expert systems approach to reducing the level of effort required to generate an accurate, reliable cost estimate of a construction project. In concert with level of effort are subjective measures of user friendliness and amount of input data required. This measure of merit will be discussed subjectively on a comparative basis.

Traditional quantity estimating requires specialized skills. Plus, it takes many man-hours of detailed efforts to measure the quantities from design drawings or specifications and mathematically compute line-item costs. By the very nature of the QTO method, near 100% design drawings are required for a good quantity estimate.

In contrast, the proposed knowledge-based approach will use menus, similar to checklists, that will clue the estimator to include all required engineering parameters. From these required parameters, the inference engine will generate, through knowledge bases, details of material, labor, and equipment and price them against cost files. Initial estimates can be generated by relatively inexperienced people. When the estimator chooses to modify the knowledge bases or engineering parameters are specialized skills required. Thus, this measure of merit (level of effort, user friendliness, and amount of input data required) should be evaluated in a comparative discussion.

# CHAPTER 4
# A KNOWLEDGE-BASED CONSTRUCTION COST SYSTEM

## Introduction

Progress in the construction industry has been made in leaps and bounds away from the age old post and lintel system of construction. Today, the industry integrates all elements of architecture and engineering with electronics, chemistry, law, and most importantly for this study, economics. Despite technological advances in many areas of the construction industry, there have been only small changes in the field of construction cost estimating/forecasting. This statement is not intended to down play the major improvements that automation and spread sheet methods have made in avoiding mathematical errors commonly found in hand calculated estimates, nor, make the advances in computerized estimating programs appear insignificant. But, for the large part these "advances" have been automation of the traditional quantity estimating processes. Even the major advances in Computer Aided Design and Drafting (CADD) systems incorporate methods to "take-off" quantities from the completed computer designs to price the project. This study asserts that these approaches, even with advances in computer technologies, are theoretically

the same as traditional quantity-take-off. A single specified design still controls the resulting costs. This study proposes an expert system designed by construction experts and used by construction experts to produce significant improvements in accuracy and reduce estimating man-hours prior to expending resources for detailed engineering analyses and drawings. Furthermore, this expert system will give construction experts automated tools to analyze engineering decisions and their relationship to costs--not just cost analyses.

The Parametric Building Cost Estimate Generator (PBCEG) designed for this study will be used as the expert system inference engine to develop new models for a specific case study. New parameters and knowledge bases for the case study will be augmented with previous knowledge bases and models developed from a wide variety of previously built projects, building codes, design criteria, and laws/regulations. The expert system designed for this study uses a modeling process that develops a means of integrating expert judgments, engineering principles, design criteria, safety codes, historical data, descriptive factors, and specific market and site information. This integration should provide unprecedented thoroughness and, thereby, significant improvements in accuracy.

The basic concept of this modeling process is that predefined knowledge bases can be developed which link basic facility parameters such as function, gross floor area, number of floors, heating load, electrical load,

etc., to detailed engineering materials and quantities which can then be priced using established cost data files. Specific relationships (models) can be specially constructed (knowledge bases designed by construction experts) for typical (generic) facility types and manipulated through a standard work breakdown system (WBS)to generate an unlimited number of combinations to produce construction cost estimates. The key to developing this integrated cost estimate generator is developing concepts of knowledge bases, a standard work breakdown structure, and functional space parameters for defining the model relationships and automatic manipulations of the relationships. Each of these concepts and the proposed method of development will be described in the following paragraphs.

## Expert Systems Design

The Parametric Building Cost Estimate Generator is a system of rules, knowledge bases, and data bases combined through algorithms to produce material, labor, and equipment quantities which are then priced against current cost data--the same cost data used for quantity-take-off estimates. The expert system has the capability to infer decisions that the expert would have made, but also encompasses the ability to query the user for the correct response based upon an algorithmic calculation and derivation from the applicable knowledge bases for the particular inference processing at that particular instant. PBCEG has the

capability to infer logic from knowledge bases but also bases but also includes the capability to modify the extracted knowledge base and change the rules based upon the default derivatives or from the users supplied rules without leaving the inference engine. Specific models are generated either from the stored knowledge bases, the request-response prompts, or a combination of predefined paths and user responses.

PBCEG is not an inference shell. PBCEG is a construction quantities and cost generator, whose inference engine and rule systems are integrally linked to construction engineering algorithms, heuristics, and design criteria. Other construction engineering knowledge bases can be generated using PBCEG. Alternatively, other construction engineering knowledge bases can be added. But, PBCEG is not a shell that can be used for totally different applications. For example, PBCEG cannot be used to cost aircraft engineering designs just by changing the knowledge application.

Rules and knowledge bases are fired within PBCEG based upon the request-response prompts to determine the initial parameters. This is a "know-how" transfer method of extracting information from knowledge bases based upon embedded rules, constraints, and user responses. Know-how is described as the multidisciplinary knowledge in the computer software to build a construction project encompassing different areas of managerial, technical, economic,

and estimating skills. The system stores extracted know-how in the PBCEG knowledge base matrices. Rules about the proper location and the movement of information are located in the knowledge bases of the system. These are then used by the PBCEG programming language and procedures. PBCEG is multiformalism (allows multiaccess and multi-extraction of knowledge information) programming software, whose architecture is forward chained, allowing the user to obtain estimate information at any given time. PBCEG is dependent upon multiple components including: driver rulesets, question rulesets, unknown answer question rule-sets, conclusion rulesets, entity rulesets, top level controls, and other peripherals.

Construction estimating is a difficult task due to the quantity and interrelationship of parameters required to provide a complete description of all specifications and source documents. PBCEG knowledge-based expert estimating techniques, with the judgment of experts imbedded and used within the inference engine, are incorporated into the design process so automated knowledge decisions can be made which take into account construction conditions that are often ill-defined in nature or have heuristic solutions. Although algorithmic programs are efficient at making large numerical computations, they are not adequate for the construction design and engineering processes involving the synthesis of functions, heuristics, rules, and experience.

Forward chaining is the calculation method used in PBCEG. PBCEG has a minimum requirement of location, building type, and gross floor area. After this information is supplied, the system will apply a wide variety of rules, extract the required information from PBCEG knowledge bases, and implement the request-response prompts and/or default parameter solution choices.

An example of the inference engine process is provided in Table 4-1 (two sheets) and accompanying Figure 4-1 (two sheets). The "T" references at the end of the paragraphs in Table 4-1 are addresses of software tables.

## Knowledge Bases

The concepts of computer applications in data manipulation can best be visualized as a continuum without clean distinctions among incremental techniques moving from higher order relational data bases to true Artificial Intelligence research. Both knowledge bases and traditional data bases are designed to store information, but they differ significantly in the types of information they store and the interrelationships among data they can handle (14). This expert system modeling approach uses knowledge-based relationships to alter the integration of functional space algorithms with building system algorithms to generate unique facility construction cost estimates within generic or typical building models.

Table 4-1
INFERENCE ENGINE EXAMPLE

TOPIC: Development of a building heat load and creation of a design and engineering solution of the heat load for one specific location

1. PBCEG requests the user to supply the minimum information for processing location, building type, and building size which are used in the development of the building heat load.

a. LOCATION:

PBCEG uses location information to fire the worldwide geographic knowledge base and identify the appropriate heating zone. After being accepted or changed by the user, PBCEG uses the heating zone to fire the heating rules and heating rules knowledge base which include parameters such as the heat load factor for the selected location. Application of these rules is dependent upon parameters associated with the selected building type. (Ref T110, T114, T117, T118, T128, T202, T203, T207, T208, T301, T308, T317).

b. BUILDING TYPE:

PBCEG uses building type information to fire the physical parameter knowledge base and construction rules by building type through which PBCEG creates prototypical parameters which effect the building heating load. These parameters are stories above grade, stories below grade, height above grade, height below grade, and perimeter. These parameters are constrained by the building size identified by the user. After being accepted or rejected by the user, PBCEG uses these parameters in the development of the heating load. (Ref T110, T121, T122, T182, T184, T308, T317).

c. BUILDING SIZE:

PBCEG uses the total building size in gross square feet to fire rules constraining the physical knowledge base selected by the building type.

The physical parameters are combined with the heating rules and heating rule knowledge base to determine the heating load. After satisfying all rules the inference engine presents the results to the user who can either accept or change the resultant heat load. (Ref T110, T121, T122, T308, T317).

Table 4-1--continued

After this "Know-how" transfer the next PBCEG inference engine is called "Building engine".

2. PBCEG uses the building heat load to fire system selection rules which are combined with additional rules and knowledge bases fired by the building type which was previously selected. (Ref T110, T121, T122, T308, T217).

a. PBCEG fires the Work Breakdown Structure (WBS) knowledge base and extracts the appropriate UNIFORMAT WBS into which quantities will be placed by PBCEG based upon the building type selected. (Ref T215).

b. PBCEG presents the user with descriptive design options based upon the building type from the Descriptive Parameter knowledge base which the user may either accept or change.

The building system is selected based upon the heat load, the UNIFORMAT WBS, and the descriptive design option. The user may either accept or change the systems selected.

3. PBCEG fires subsystem selection rules based on the systems selected. The subsystems are selected based upon the heat load, the UNIFORMAT WBS, and the descriptive design option. The user may either accept or change the subsystems selected. (Ref T110, T121, T122, T184, T215, T308, T317, T386)

4. PBCEG fires assembly category selection rules based on the subsystems selected. The assembly categories are selected based upon the heat load, the UNIFORMAT WBS, and the descriptive design option. The user may either accept or change the assembly categories selected. (Ref T110, T121, T122, T180, T190, T215, T308, T317, T386).

5. PBCEG fires assembly identifier knowledge base, the density parameter knowledge base, and assembly selection rules based on the assembly category selected. PBCEG then presents the user with the type of assembly and the quantity of that assembly which will satisfy the heat load of the building. PBCEG also presents the user with the other assemblies which can satisfy the heat load of the building. The user has the option of accepting or changing the type and quantity of the selected assemblies prior to cost calculation. (Ref T108, T110, T121, T122, T180, T184, T190, T194, T215, T308, T317, T324, T386).

Table 4-1--continued

6. These inference engines can process through multiple and sometimes differing paths based on a combination of heuristic rules, calculations, and engineering solutions to impute the assemblies which in turn produce quantities of material, labor, equipment, and costs for each area location. In attachment 2 the heat load inference engine is an example of one of 800 possible heat load processes of the PBCEG system. This is only for processing the heat load inference engine. There are billions of other possibilities available for processing the whole PBCEG inference engine.

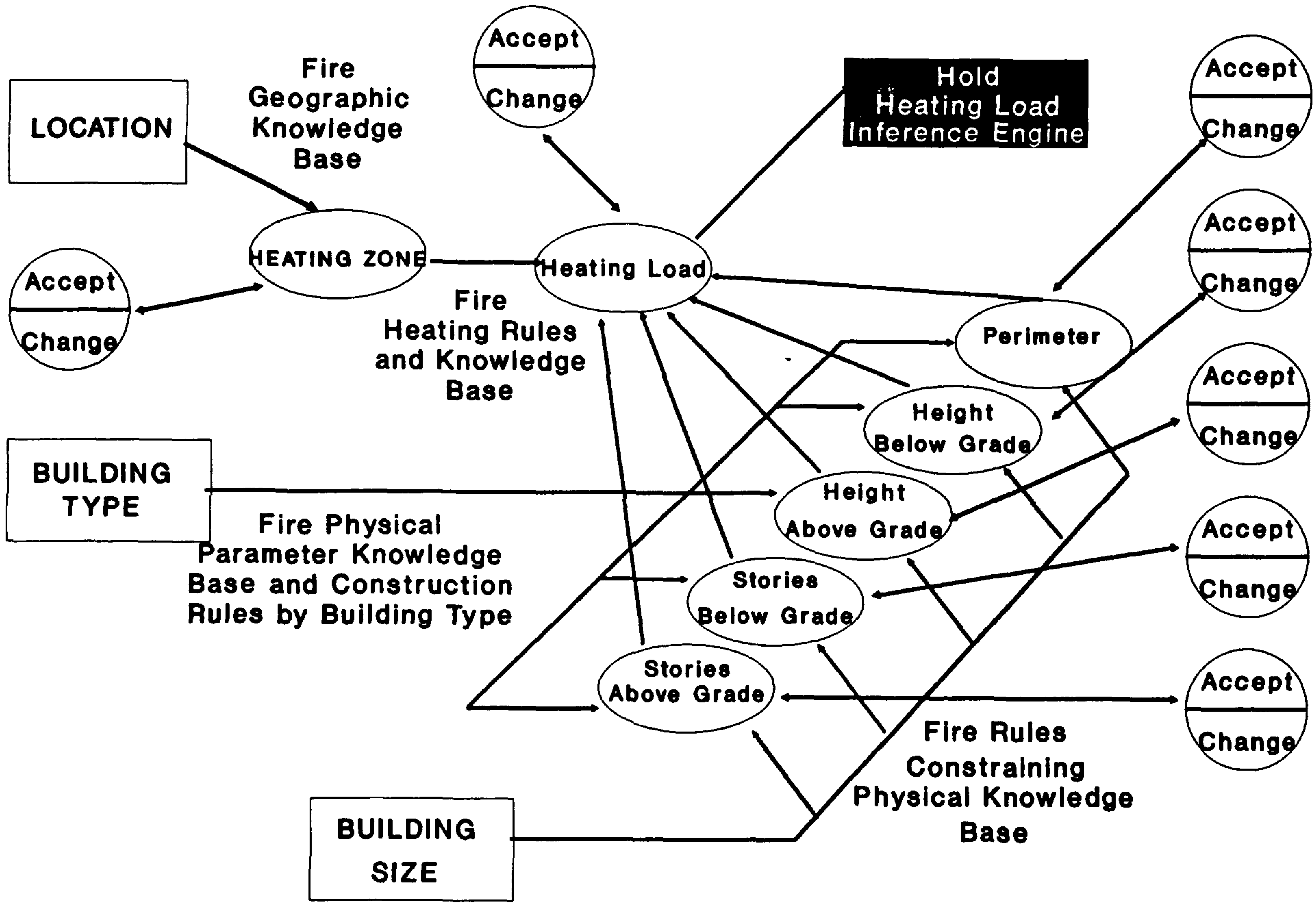


Figure 4-1. Sample Inference Engine

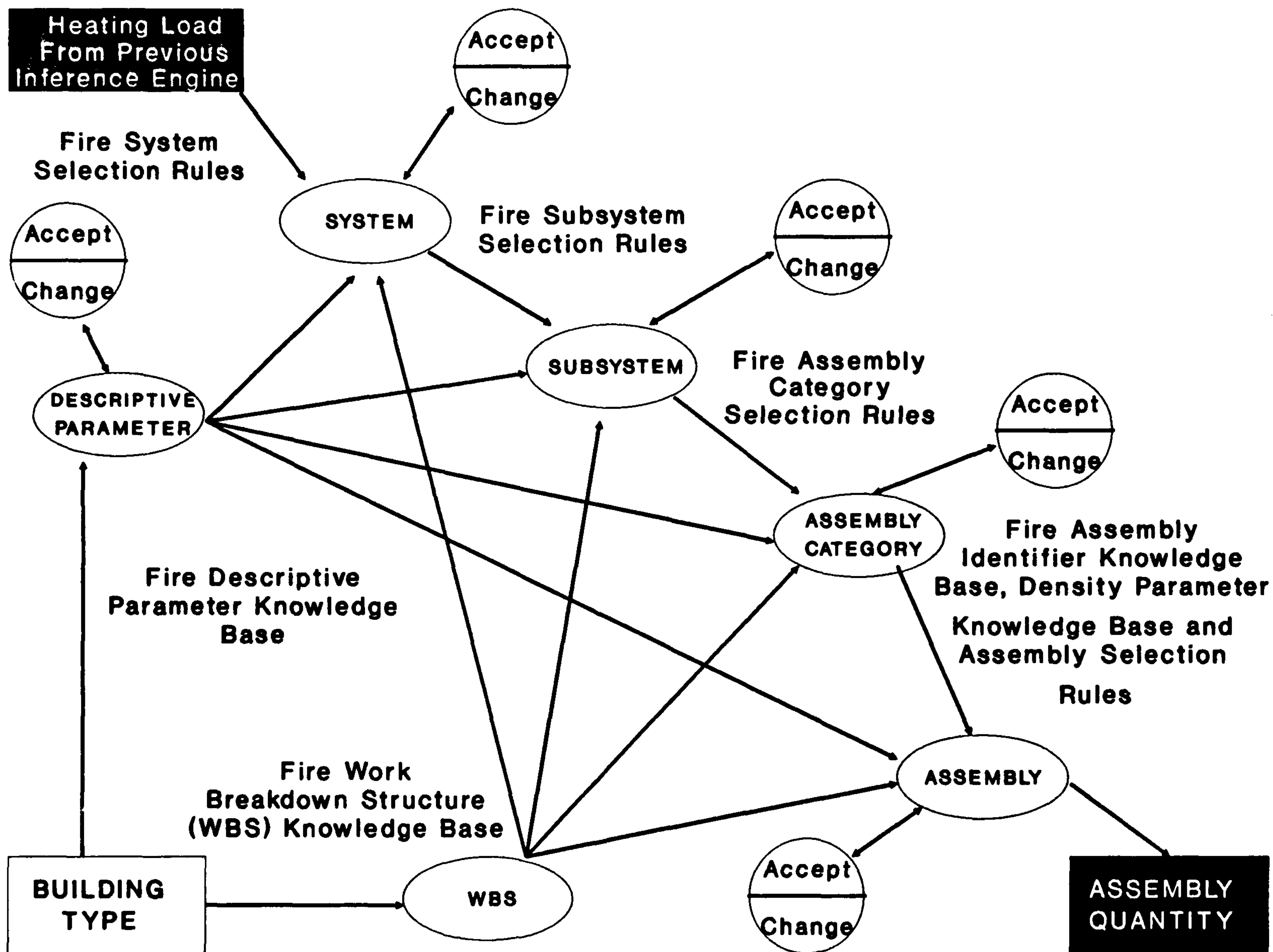


Figure 4-1--continued

The knowledge bases are assimilations of expert judgments, historical data, algorithms, engineering principles, building codes and regulations, and statistical methods that can be manipulated and combined automatically in the expert system. For example, to model the cost impact of increasing seismic design requirements, traditional parametric systems would factor the overall cost based on historical data. But, if modeling a seismic requirement change to a concrete building, this expert system would account for actual design changes by modifying the substructure, the superstructure, and exterior closure by adjusting the reinforcing and grouting used on the concrete masonry backwall. The knowledge bases not only modify the factors but alter the path through the hierarchy to properly model changes in the facility. The function of the knowledge base is to model the construction methods and design changes that a construction expert would recognize.

For another example, adjusting a design on an administrative facility from Gainesville to St Louis is more than a simple cost factor. The knowledge base would change the foundation modeled from spread footing to pile foundations, thus reflecting the typical construction methods required in different areas of the country. Both methods are used to forecast changes in costs for changing requirements, but traditional parametric methods only allow analyses of costs where this method allows analyses of the engineering decisions as well as the resulting cost changes.

## Work Breakdown Structure

A Work Breakdown Structure (WBS) is a structured hierarchy to breakdown a complex system into logical components. Two major categories of work breakdown structures are common in the construction industry. They are the UNIFORMAT originally developed by the U.S. Government, General Services Administration. UNIFORMAT develops cost categories of building components based on where they are found in the facility, such as roofing or exterior closure systems. The Construction Specifications Institute (CSI) MASTERFORMAT WBS divisions are organized around trade/labor categories and material suppliers such as concrete or metals. Figure 4-2 gives a comparison of the UNIFORMAT and MASTERFORMAT categories (11, 75 and 76).

The expert system is built around a tree-type structure comprised of five levels: facility, system, subsystem, assembly, and composite/element. Default quantity knowledge-based relationships are developed to link each level of the WBS for each predefined generic facility type. As the knowledge base deaggregates the building systems into detailed material, labor, and equipment quantities, the WBS maps the UNIFORMAT building systems (WBS) to the Construction Specifications Institute (CSI) MASTERFORMAT for material, labor, and equipment detailed quantities. Figure 4-3 is a graphic depiction of the hierarchical mapping for a Test Operations Control Center while Figure 4-4 gives a more general description and examples of the UNIFORMAT structure designed for this study.

| UNIFORMAT | MASTERFORMAT |
|---|---|
| 01 SUBSTRUCTURE | 01 GENERAL REQUIREMENTS |
| O2 SUPERSTRUCTURE | 02 SITE WORK |
| 03 ROOFING | 03 CONCRETE |
| 04 EXTERIOR CLOSURE | 04 MASONRY |
| 05 INTERIOR CONSTRUCTION | 05 METALS |
| 06 INTERIOR FINISHES | 06 WOOD & PLASTICS |
| 07 SPECIALTIES | 07 MOISTURE/THERMAL |
| 08 PLUMBING | 08 DOORS, WINDOWS, & GLASS |
| 09 H.V.A.C. | 09 FINISHES |
| 10 SPECIAL MECHANICAL | 10 SPECIALTIES |
| 11 ELECTRICAL | 11 EQUIPMENT |
| 12 SPECIAL ELECTRICAL | 12 FURNISHINGS |
| 13 EQUIPMENT | 13 SPECIAL CONSTRUCTION |
| 14 CONVEYING SYSTEMS | 14 CONVEYING SYSTEMS |
| | 15 MECHANICAL |
| | 16 ELECTRICAL |

Figure 4-2. Comparison of WBS Categories

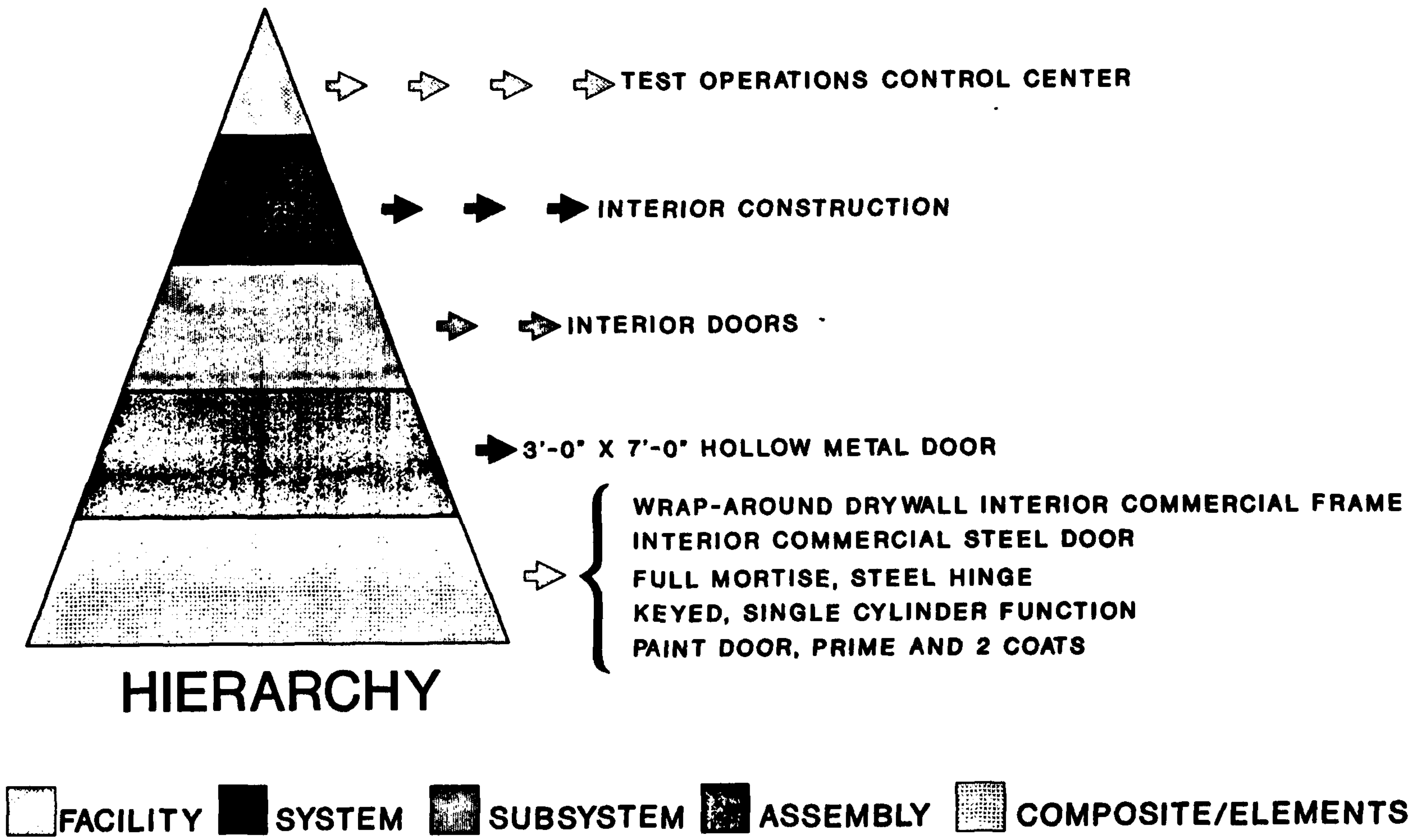


Figure 4-3. Parametric Building Cost Estimate Generator (PBCEG)

| Level | Description and Examples |
| --- | --- |
| Facility | The entire facility including the primary facility and associated supporting facilities. Note that the GSM building models only develop quantities for primary facilities. Supporting facilities quantities and costs can be developed using the Supporting Facilities Model. |
| System | Divides the Facility into primary functional areas. Example: substructure, superstructure, mechanical, and electrical systems. |
| Subsystem | Sub-divides the System into functionally distinguishable parts. Example: superstructure is comprised of floor construction, and stair construction subsystems. |
| Assembly Category | Sub-divides the Subsystem into functional components. Example: floor construction is comprised of suspended basement floors, upper floors, balconies, and ramps. |
| Assembly | Sub-divides Assembly Category into specific building solutions of the category. Example: upper floor assemblies include 24" wide cast in place concrete pan joist system, 18" precast double tee system, series H bar joist with steel frame, etc. |
| Composite Elements | Composites are the most common items in the quantity takeoff database. Examples: parts and tasks required. to build supported floor, including set and strip forms, place rebar, and pour concrete. Elements are the materials, labor, and equipment needed to perform the composite level tasks. Examples: labor crew, hydraulic crane, rebar, forms, and temporary shoring. Note: most QTO cost line items are priced at the composite level. |

Figure 4-4. UNIFORMAT Hierarchy Structure

## Model Parameters

Two types of parameters will be defined in the modeling process--building parameters and functional space parameters. Building parameters are building system algorithms that are used throughout the facility cost model, such as exterior closure or roofing system. In contrast, the functional space parameters are subsystem algorithms that change depending on the functional use for a specific part of a building. For example, floor covering, wall finishes, electrical loads, etc., will change depending on the functional use of the building area. Some typical functional spaces in office or administrative type facilities are open office space versus closed office space, computer rooms, and vault/secure areas. Examples of construction components that would change include raised flooring for computer rooms and electromagnetic shielding in the vault areas. These functional space algorithms are based on engineering equations, design criteria, and construction methods derived from as-built drawings or historical data bases (75). The modeling process includes developing default algorithm relationships for functional space areas that can be automatically combined through knowledge bases discussed in the next subsection. Table 4-2 displays a listing of the facility parameters, the choice ranges, and the unit of measure.

Table 4-2
MODEL PARAMETERS (75)

MINIMUM PARAMETERS:

GROSS FLOOR AREA (SF)
MODEL FULL SCOPE (SF)
MODEL HALF SCOPE (SF)
PROJECT TOTAL SCOPE (SF)
PROJECT FULL SCOPE (SF)
PROJECT HALF SCOPE (SF)
STORIES ABOVE GRADE (ST)

LOCATION MODIFIERS:

SEISMIC ZONE--VALID SEISMIC ZONES ARE:
0 - NO DAMAGE
1 - MINOR DAMAGE
2 - MODERATE DAMAGE
3 - MAJOR DAMAGE
4 - CLOSE PROXIMITY TO MAJOR FAULT SYSTEM

A/C WEATHER ZONE--VALID A/C WEATHER ZONES ARE:

| ZONE | DESIGN DEGREE RANGE |
|---|---|
| A | AREAS WHERE THE WET BULB TEMPERATURE IS 75F OR HIGHER LESS THAN 150 HOURS DURING THE 6 WARMEST MONTHS OF THE YEAR, AND THE DRY BULB TEMPERATURE IS 93F OR HIGHER 155 OR MORE HOURS DURING THE SAME PERIOD. |
| B | AREAS WHERE THE WET BULB TEMPERATURE IS 67F OR HIGHER 800 OR MORE HOURS DURING THE 6 WARMEST MONTHS OF THE YEAR, PROVIDED THAT THE AREA DOES NOT QUALIFY UNDER ZONE A. |
| C | AREAS WHERE THE DRY BULB TEMPERATURE IS 80F OR HIGHER FOR 360 HOURS OR MORE DURING THE 6 WARMEST MONTHS OF THE YEAR. |
| D | AREAS WHERE THE DRY BULB TEMPERATURE IS 80F OR HIGHER FOR LESS THAN 360 HOURS DURING THE 6 WARMEST MONTHS OF THE YEAR. |

HEATING/INSULATION ZONE--VALID ZONES ARE:
A = -40 TO -10 DEGREES FAHRENHEIT
B = -9 TO +10 DEGREES FAHRENHEIT
C = +11 TO +50 DEGREES FAHRENHEIT
D = N/A

FROST LINE DEPTH (IN)
VALID FROST LINE DEPTHS CAN BE 0 TO 99 INCHES. A MODIFICATION TO INCREASE THE AMOUNT OF FOUNDATION WALL WILL BE MADE IF THE VALUE ENTERED IS GREATER THAN ZERO.

Table 4-2--continued

FUNCTIONAL SPACE AREAS:

COVERED WALKWAYS AND SERVICE AREAS (SF)
LAUNDRY, STORAGE, AND MAID'S ROOM (SF)
LOUNGE AND GAME ROOM (SF)
MECHANICAL, ELECTRICAL, & BUILDING SUPPORT (SF)
ENLISTED QUARTERS (544 SF/UNIT) (SF)

QUANTITY PARAMETERS:

FLOOR TO FLOOR HEIGHT ABOVE GRADE (FT)
FLOOR TO FLOOR HEIGHT BELOW GRADE (FT)
FLOOR TO CEILING HEIGHT ABOVE GRADE (FT)
FLOOR TO CEILING HEIGHT BELOW GRADE (FT)
FOOTPRINT (SF)
AIR CHANGES PER HOUR (ACH)
PLUMBING DOMESTIC WATER SUPPLY (EA)
PLUMBING SANITARY WASTE SYSTEM (EA)
PERIMETER (LF)
ROOF AREA (SF)
EXTERIOR WALL AREA (SF)
EXTERIOR WINDOW AREA (SF)
HEATING LOAD (MBH)
COOLING LOAD (TONS)
ELECTRIC LOAD (AMPS)
EXTERIOR DOORS (EA)

DESCRIPTIVE PARAMETERS:

SOIL TYPE
1=LOW BEARING CAPACITY (LESS THAN 2000 PSF)
2=AVERAGE BEARING CAPACITY (2000 - 3500 PSF)
3=HIGH BEARING CAPACITY (GREATER THAN 3500 PSF)

FLOOR STRUCTURE TYPE
1=CONCRETE FRAME
2=STEEL FRAME-LIGHT LOAD W/ REINFORCED CONCRETE DECK
3=STEEL FRAME-HEAVY LOAD W/ REINFORCED CONCRETE DECK
4=STEEL FRAME-LIGHT LOAD-MTL JOISTS-STL DECK W/ CONC FILL
5=STEEL FRAME-HEAVY LOAD-MTL JOISTS-STL DECK W/ CONC FILL
6=LOAD BEARING MASONRY FRAME-MTL JOISTS-STL DECK W/CONC FILL
7=N/A

ROOF STRUCTURE TYPE
1=CONCRETE FRAME
2=STEEL FRAME-LIGHT LOAD W/ REINFORCED CONCRETE ROOF DECK
3=STEEL FRAME-HEAVY LOAD W/ REINFORCED CONCRETE ROOF DECK
4=STEEL FRAME-LIGHT LOAD-METAL JOISTS WITH STEEL ROOF DECK

Table 4-2--continued

5=STEEL FRAME-HEAVY LOAD-METAL JOISTS WITH STEEL ROOF DECK
6=LOAD BEARING MASONRY EXTERIOR WALL-METAL JOISTS WITH STEEL ROOF DECK
7=LOAD BEARING CONCRETE, MASONRY, OR WOOD EXTERIOR WALL-WOOD TRUSSES W/ PLYWOOD ROOF DECK
8=AIRCRAFT HANGAR HIGH BAY
9=RIGID FRAME (TYPICAL METAL BUILDING)

BAY SIZE/SPAN LENGTH
1=SMALL 0-30 LF
2=AVERAGE 30-50 LF
3=LARGE 50-95 LF
4=SPECIAL 95-144 LF

STAIR TYPE
1=CONCRETE
2=METAL PAN
3=N/A

ROOFING TYPE
1=SINGLE MEMBRANE
2=BUILT-UP
3=SHINGLE
4=STANDING SEAM METAL
5=CLAY TILE
6=METAL (TYPICAL METAL BUILDING)

EXTERIOR WALL TYPE
1=BRICK VENEER
2=TILT-UP CONCRETE
3=EXPOSED AGGREGATE PRECAST
4=METAL SANDWICH
5=CAST IN PLACE REINFORCED CONCRETE
6=CONCRETE BLOCK
7=LOAD BEARING MASONRY WITH BRICK VENEER
8=LOAD BEARING 2 X 4 WOOD STUD W/ BRICK VENEER
9=METAL SIDING (TYPICAL METAL BUILDING)

HEAT GENERATING SYSTEMS
1=STEAM BOILERS
2=HOT WATER BOILERS - OIL FIRED
3=HOT WATER BOILERS - GAS FIRED
4=GAS FURNACE
5=OFFSITE CENTRAL PLANT
6=N/A

COOLING GENERATING SYSTEMS
1=RECIPROCATING - CHILLER
2=RECIPROCATING - DIRECT EXPANSION

Table 4-2--continued

3=CENTRIFUGAL
4=ABSORPTION
5=OFFSITE CENTRAL PLANT
6=N/A

DENSITY PARAMETERS - FSA:

INTERIOR PARTITIONS - LAUNDRY, STORAGE & MAID RM (SF)
INTERIOR DOORS - LAUNDRY, STORAGE & MAID RM (EA)
INT WALL FINISH - LAUNDRY, STORAGE & MAID RM (SF)
PLUMBING FIXTURES - LAUNDRY, STORAGE & MAID RM (EA)

INTERIOR PARTITIONS - LOUNGE AND GAME ROOM (SF)
INTERIOR DOORS - LOUNGE AND GAME ROOM (EA)
INT WALL FINISH - LOUNGE AND GAME ROOM (SF)
PLUMBING FIXTURES - LOUNGE AND GAME ROOM (EA)

INTERIOR PARTITIONS - MECH, ELEC & BLDG SUP (SF)
INT WALL FINISH - MECH, ELEC & BLDG SUP (SF)

INTERIOR PARTITIONS - ENLISTED QUARTERS (SF)
INTERIOR DOORS - ENLISTED QUARTERS (EA)
INT WALL FINISH - ENLISTED QUARTERS (SF)
PLUMBING FIXTURES - ENLISTED QUARTERS (EA)

Quantity parameters are used to quantify the facility or certain components of the facility. Once calculated or determined by the analyst, these parameters are used in the subsystem algorithms to define subsystem quantity. Descriptive parameters, on the other hand, are used to define certain components of the facility such as exterior closure type, roof type, structure type, etc. The expert system includes user queries for descriptive parameters. These parameters provide the user with menu driven choices. These selected parameters are used to provide the automatic selection of specified assemblies that would be required to construct the facility using the type of construction specified by the chosen parameter. These parameters are used at the assembly level to select the appropriate facility components that reflect the design in question. The same decision tree method is applied when an assembly choice is affected by several parameter choices. For example, if different choices are made from the screen menus of soil types and foundation types, differing path combinations will be executed based on the selections made. The user is allowed and encouraged to override the default values with specific information known about the project.

The expert system uses quantity modifier algorithms at two levels to account for site-specific construction requirements based on climactic conditions, soil conditions, and seismic zones. At the parameter level, climactic conditions are used to modify the heating and

cooling load calculations that in turn will effect the type and size of the heating and cooling systems. These adjustments are based on the cooling and heating zones for the specified location. At the assembly level, modifiers are used to account for seismic zone, soil condition, and frost penetration. The modifier algorithms serve to modify the structural systems for foundation and superstructure assemblies to properly account for special requirements caused by these location specific conditions.

, Subsystem Algorithms

The subsystem algorithms are used to calculate the quantities for each subsystem in the proposed facility. The subsystem quantities and associated costs serve as the basic quantity value to be used in establishing an audit trail for cost management. Within the formally structured UNIFORMAT WBS, standard subsystem titles and units of measure are defined to be independent of specific building types so subsystem algorithms are constant for all facility types. Subsystem quantity algorithms included in the models are based on these standards.

All the model subsystems algorithms are based on a predefined relationship between one or more of the model parameters. No data base factors are used at this level. As before, the estimator is allowed (and encouraged) to override the values calculated by the expert system, if more specific data are known.

## Direct Construction Cost Calculation Process

Direct Construction costs are defined as those cost elements that are required to perform the actual construction of the project and generally include the on-site construction labor, materials, and equipment required to build the facility. (Refer to Figure 4-5.) Other included items are the cost to transport the materials to the site, off-site fabrication of components such as precast concrete, structural steel, boilers, etc. Mobilization costs associated with specific construction tasks such as setting up a pile driver are included in direct cost calculations. However, general job site mobilization is not included in direct costs but are calculated in overhead expenses for total construction costs. The expert system uses the construction quantities calculated through the hierarchical knowledge-based structure combined with the detailed material, labor, and equipment cost elements from current (as opposed to historical unit cost data files) cost data files to calculate direct construction costs. Detailed material, labor, and equipment cost elements are priced from a public domain data base from the U.S. Army Computer Aided Cost Estimating System (CACES) Unit Price Book (UPB) (82).

## Total Construction Cost Calculation Process

Total construction costs are calculated after direct costs are computed. (Refer to Figure 4-5, sheet 7.)

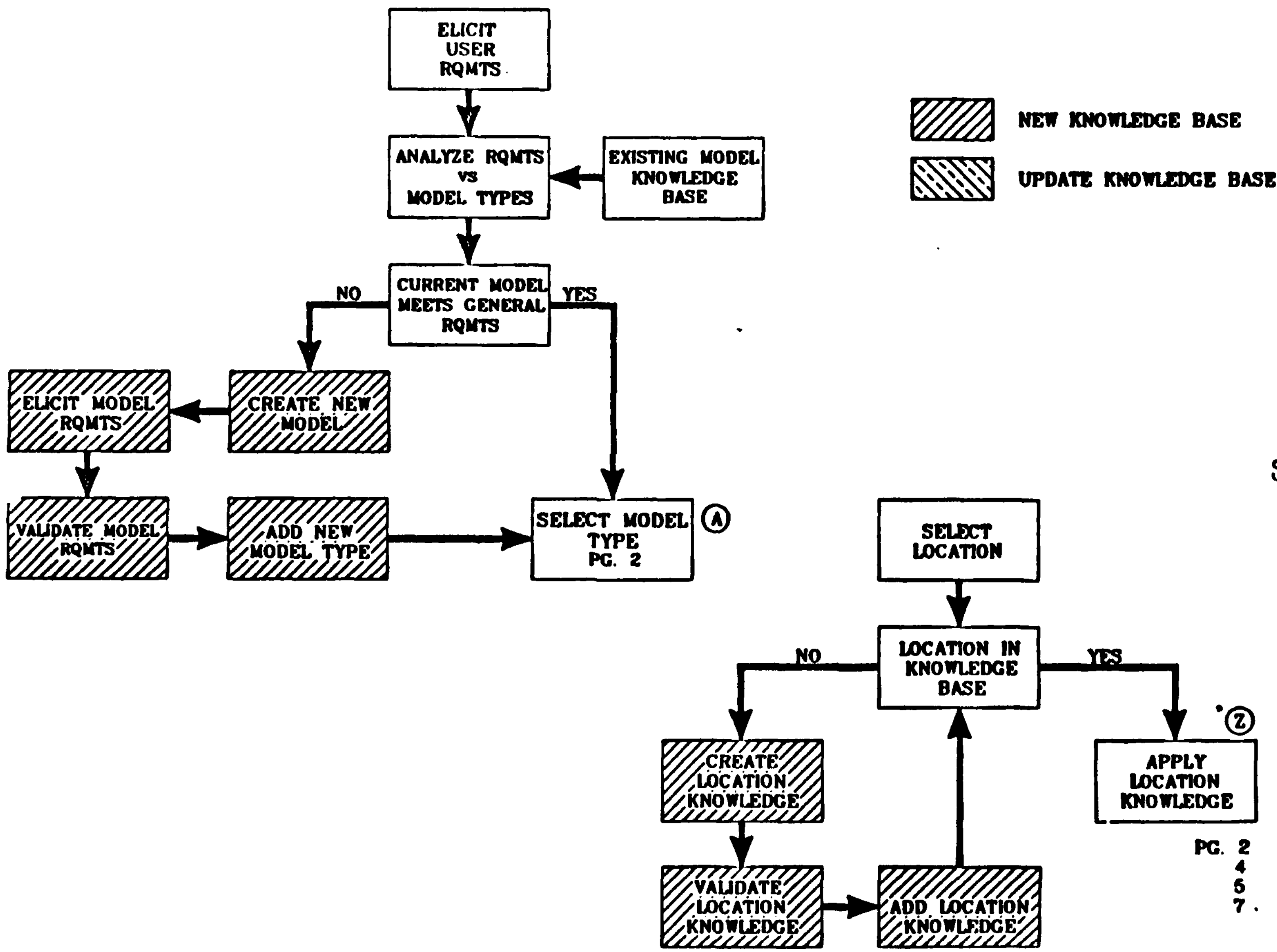


Figure 4-5. Process Flow

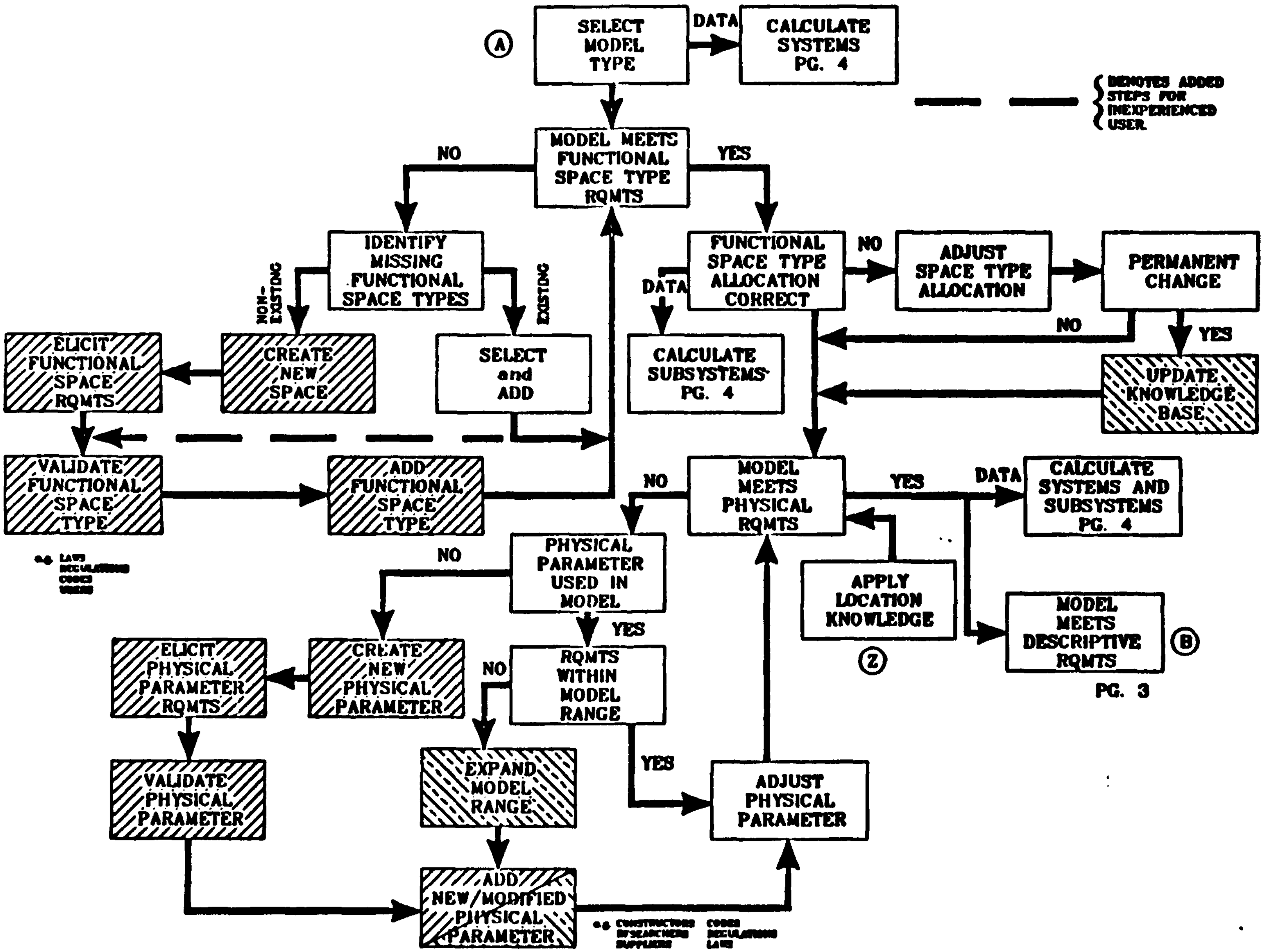


Figure 4-5--continued

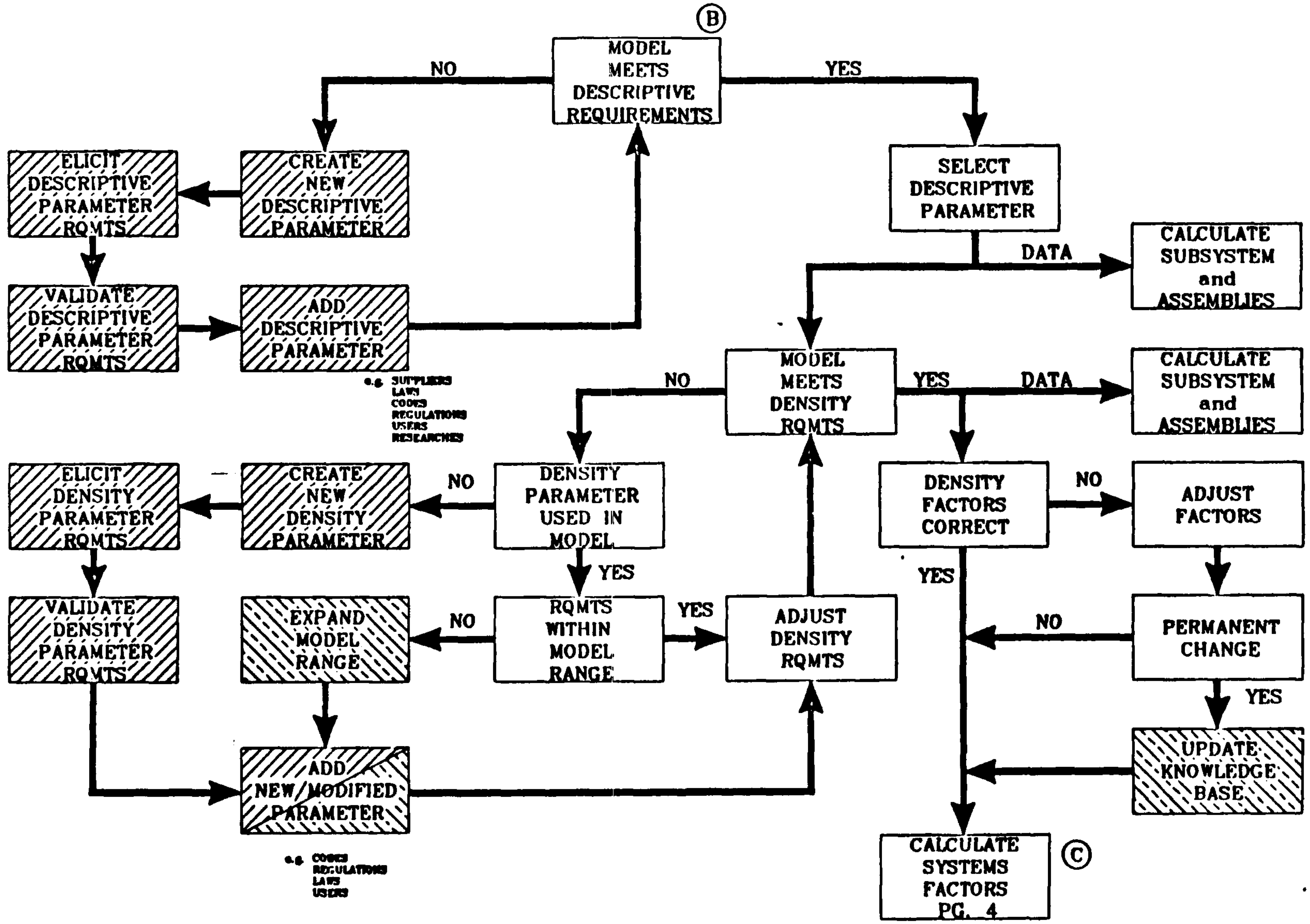


Figure 4-5--continued

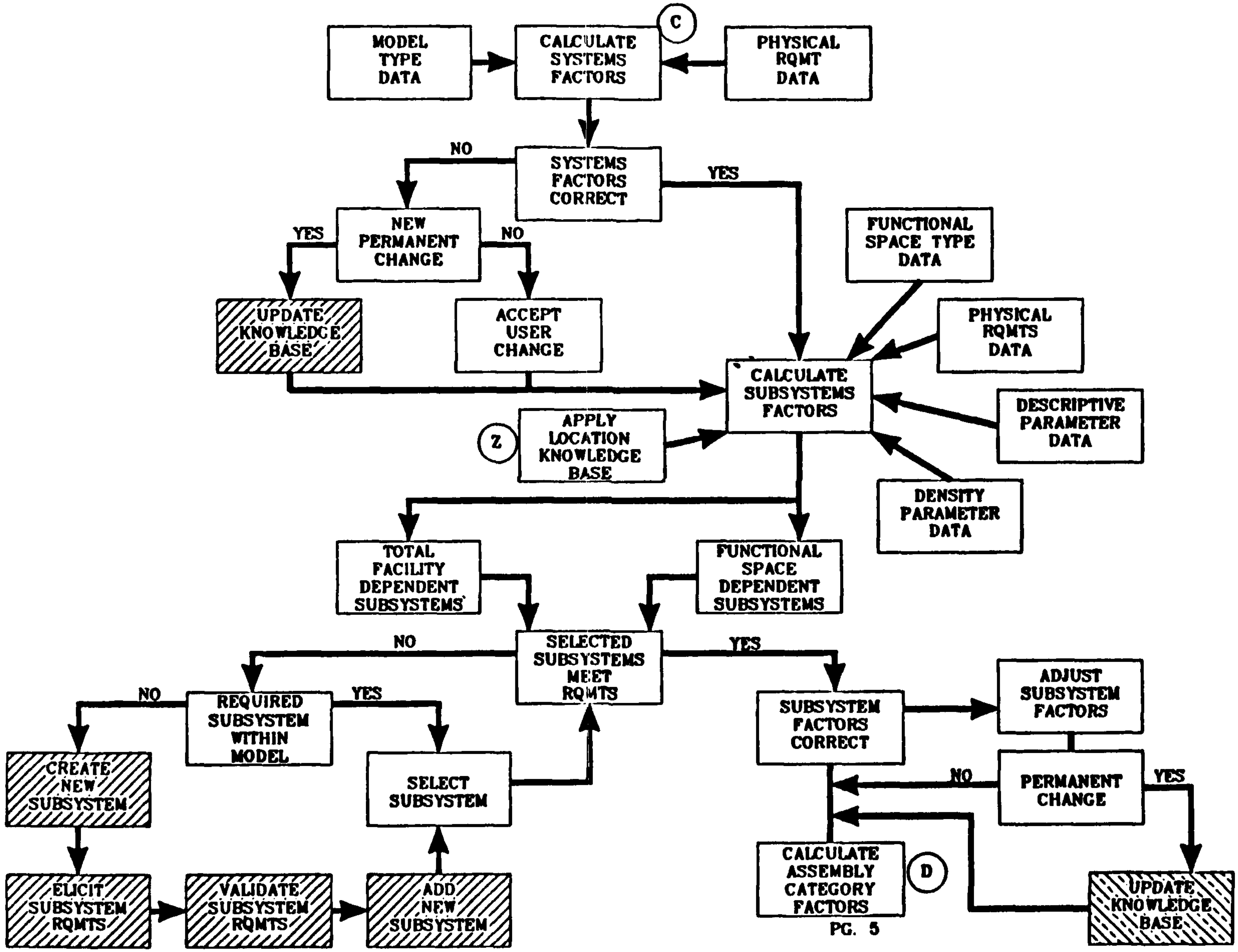


Figure 4-5--continued

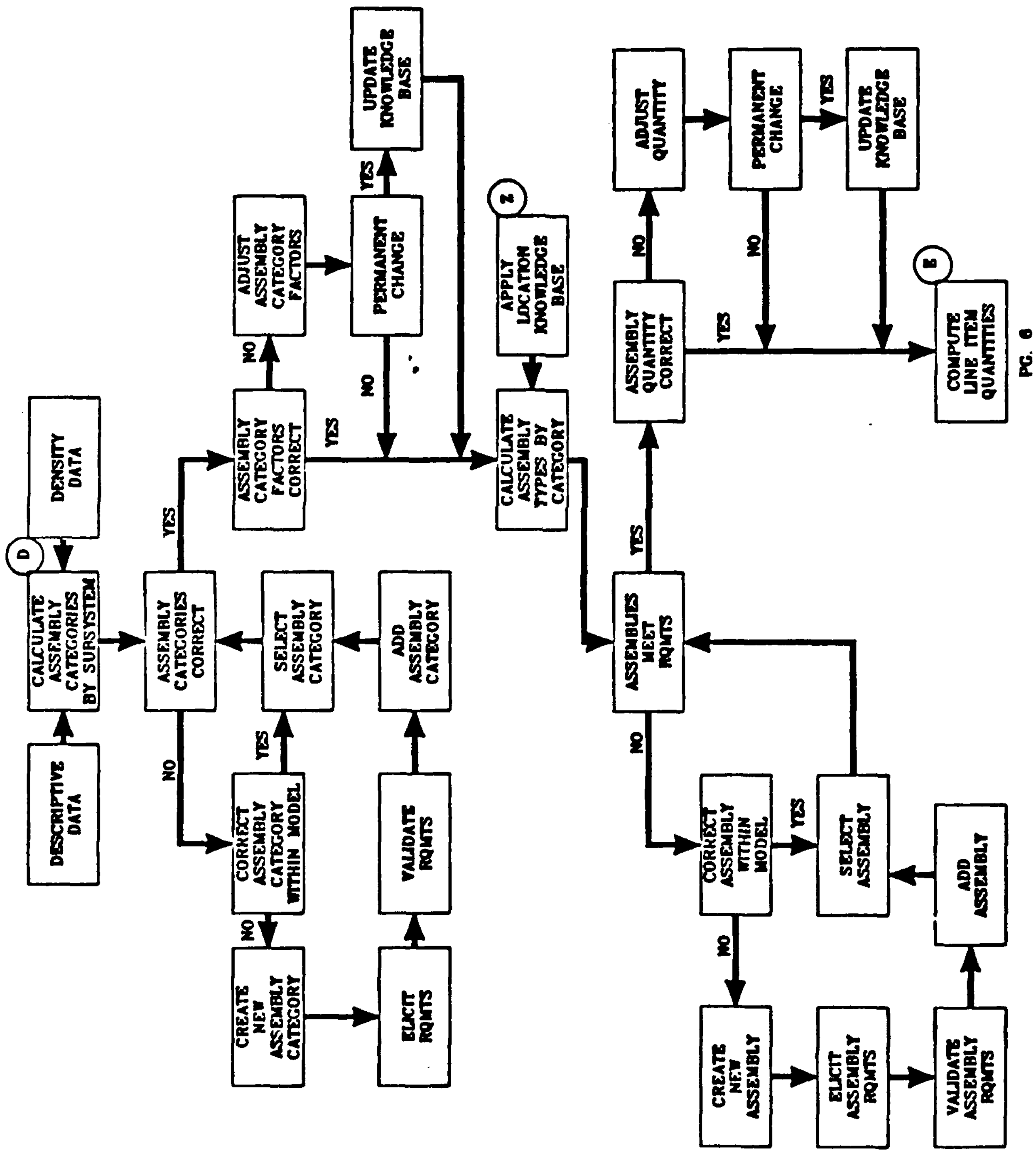


Figure 4-5--continued

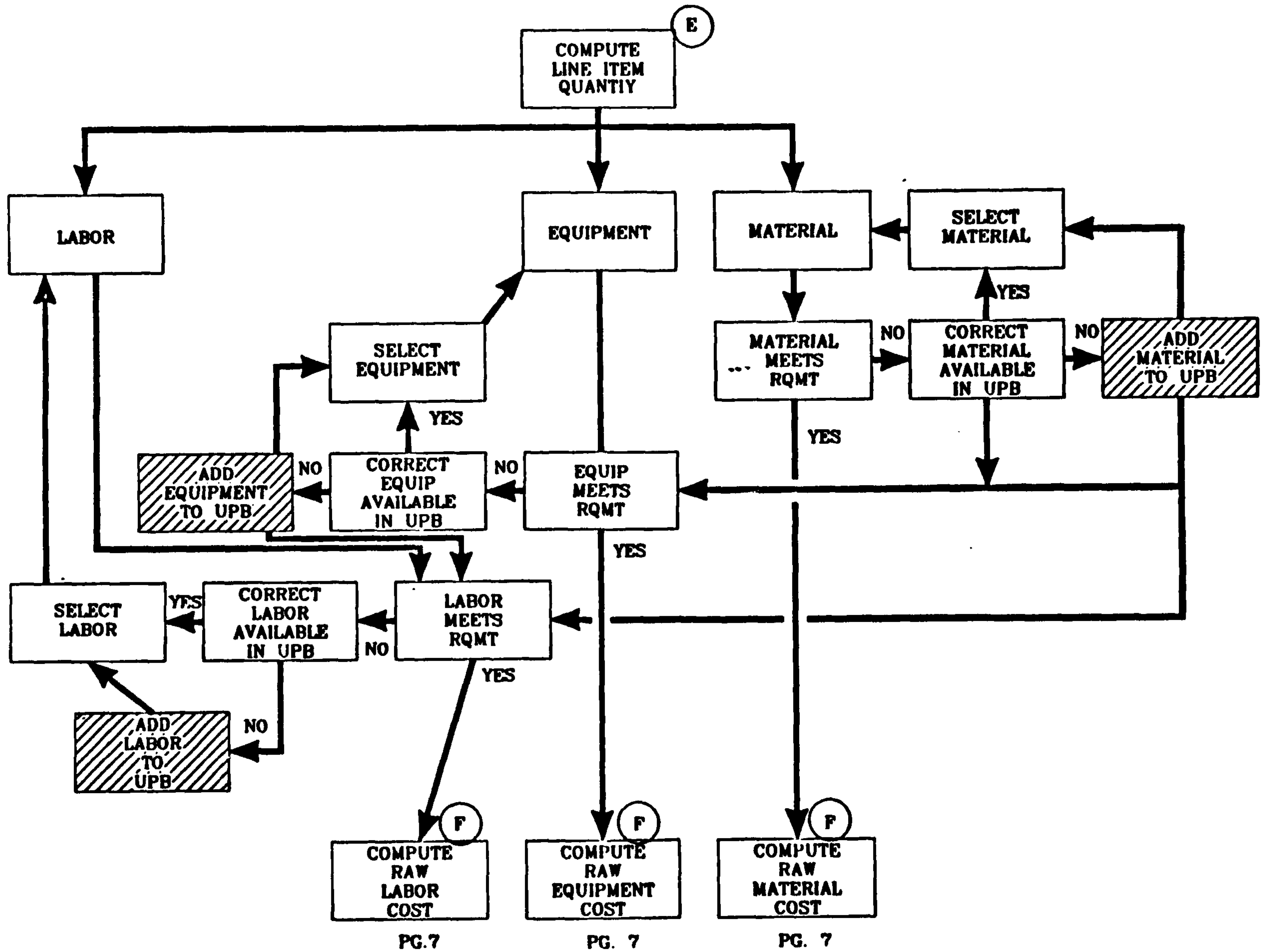


Figure 4-5--continued

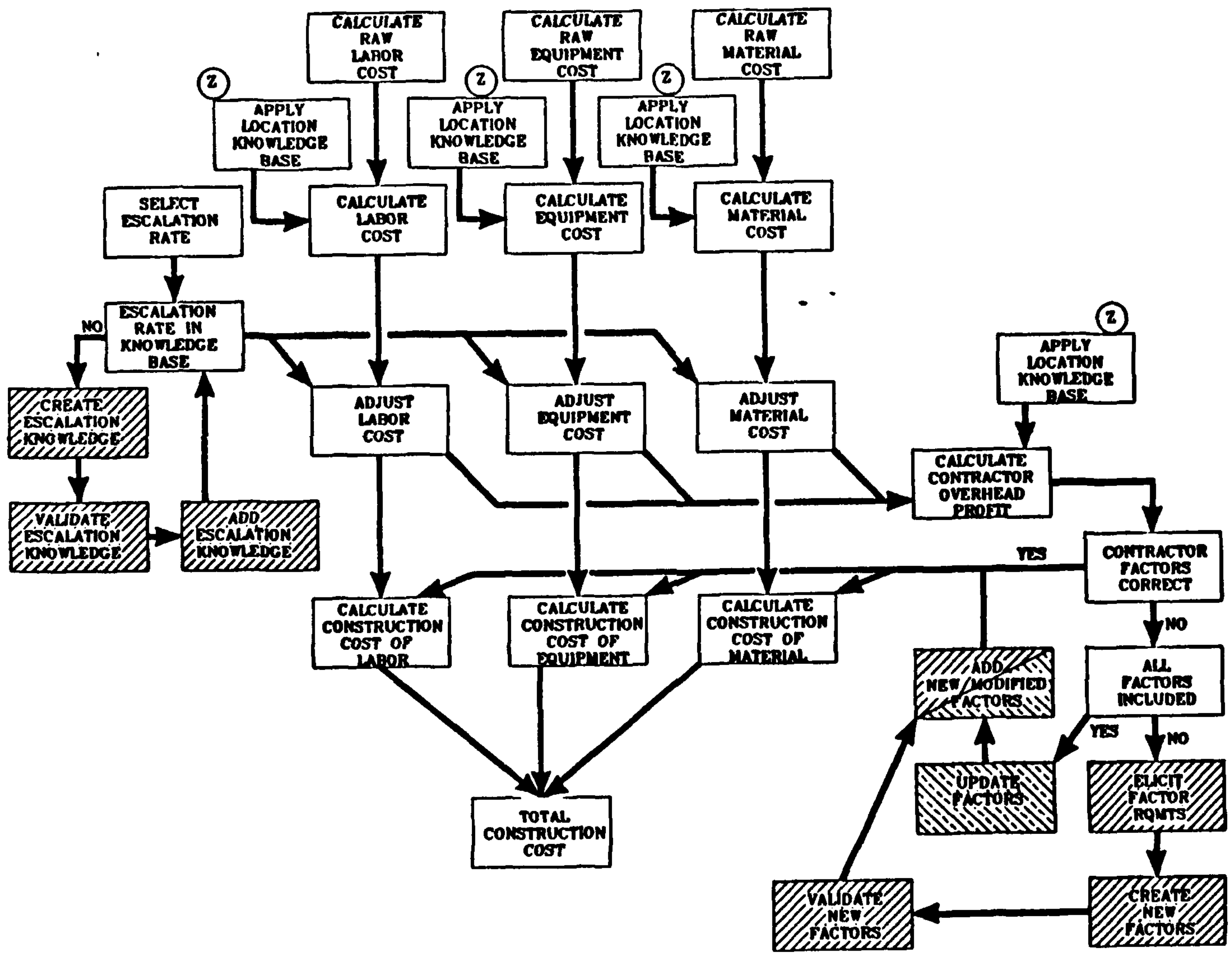


Figure 4-5--continued

Location modifiers for site-specific material, labor, and equipment fluctuations are drawn from the knowledge base. These modifiers are applied separately to the material, labor, and equipment direct cost calculations because the components of cost vary at differing rates in different locations. The site-specific adjusted cost components are then escalated for economic and time variability by applying escalation modifiers from the escalation knowledge bases. These modifiers are also applied independently to the cost components because they vary at differing rates. Contractor overhead and profit calculations are modified also by site factors drawn from the location modifier knowledge bases. The contractor overhead and profit data are allocated among the prime contractor and the major and minor subcontractors by the CSI MASTERFORMAT divisions. The contractor indirect costs are drawn and calculated from knowledge bases. Certain indirect costs are directly attributable to the material, labor, and equipment site-specific direct cost components. Profits are then calculated separately for prime contractors, major subcontractors, and minor subcontractors. Prime contractor profit is adjusted for prime contractor profit on subcontractors. All of the now site-specific cost components are summed for the project construction costs. Additional factors for cost contingencies and/or owner or owner representative supervision, oversight, or inspection are applied external to the expert system.

# CHAPTER 5
# CASE STUDY

## Description of Case Study

A nursing home was chosen for this case study to demonstrate the ability to use a knowledge-based system to combine functional spaces into a variety of uses. For modeling purposes, a nursing home provides an excellent case study because it combines many functional spaces that are commonly found in individual use facilities. For example, the nursing home chosen provides construction interrelations among quarters (bed spaces); dining areas; nursing stations; lounge and game rooms; laundry; administrative office spaces; and building areas such as mechanical rooms, storage, and covered walkways or service areas. Another reason for choosing a nursing home was to demonstrate that knowledge bases built predominately from military data sources can have direct applicability to private sector construction. Because military bases are microcosms of cities, most examples of private sector construction can be found on a military base. The military services do not build nursing homes. Thus, using a nursing home for the case study demonstrates complex modeling interrelationships and the applicability of the knowledge bases to nonmilitary construction.

The particular construction project chosen is the Walton County Convalescent Center in Defuniak Springs, Florida. The architect is Allen Ray McGinnis from Atlanta, Georgia; structural engineer--Nannis and Associates; mechanical engineer--William E. Wendle P.E., Wendle and Associates; and electrical engineer--Homer A. Ooten, Ooten and Associates, P.A. All are licensed to practice their disciplines in the state of Florida. As described in the project specifications (58), the project is a major addition/alteration to an existing Walton County Convalescent Center at 614 South 2nd Street, Defuniak Springs, Florida. The main portion of the single story work is new construction of quarters/rooms housing 60 beds (32 nursing and 28 Adult Congregrate Living Facility (ACLF)) with ancillary nursing and support areas.

The design of the construction consists of concrete, masonry walls, structural steel, structural precast concrete roof panels, architectural woodwork, waterproofing, insulated built-up roofing, fiberglass shingles, roof accessories, sheet metal, hollow metal doors and frames, horizontal sliding aluminum windows, fixed aluminum windows, hardware, glazing, interior finishes, plumbing, fire protection, nurse call, fire alarm systems, heating-ventilating-air conditioning, lighting and electrical power. The owner will provide certain pieces of equipment, but the contractor will provide electrical and mechanical connections as indicated on the drawings. Although the

work includes dining facilities, no new kitchen equipment is included in the project. Electrical power supply and telephone and television cabling will be provided by the local utility companies. No unusual site work, environmental conditions, or general conditions are anticipated for the work.

For this case study, multiple computer runs and modeling changes were made. To follow the case comparisons, the reader may refer to the model outputs in the appendices listed below:

| APPENDIX | TITLE |
|---|---|
| A. | GENERIC DORMITORY MODEL, COMPUTER OUTPUT, DEFAULT RUN |
| B. | GENERIC NURSING HOME MODEL, COMPUTER OUTPUT, PROJECT DEFINITION RUN |
| C. | NURSING HOME DESIGN MODEL, COMPUTER OUTPUT, QTO RUN, DIRECT COSTS |
| D. | NURSING HOME DESIGN MODEL, COMPUTER OUTPUT, CONSTRUCTION COSTS |
| E. | APPLICATION AND CERTIFICATE FOR PAYMENT, AIA DOCUMENTS G702/G703, Brookwood Investments, Ltd, Project: Walton County Convalescent, undated. |

Case Comparison. The case study began with a selection of the "closest fit" model from the previously defined knowledge-base combinations of generic building models in Table 5-1. Although this selection of "closest fit" model

can be skipped if the cost engineer is intimately familiar with the modeling processes and contents, a "closest fit" model usually provides a good starting point and saves time and effort (even for the experienced user) in adapting the specific project to existing knowledge bases. Next, additional functional space areas are selected from the list provided in Table 5-2 (four pages). When the appropriate functional space areas have been added to the "closest fit" model, the engineer must reallocate the gross square footage among the functional spaces. Each default value is changed/overridden by the engineer to model the project specific values.

In construction cost estimating theory, more specificity results in better accuracy (assuming it is free of errors), such that, a good quantity-take-off is considered the most accurate estimate for a specific project. In parametric cost engineering modeling, the time required to gain increases in accuracy by increased specificity should be balanced by the time invested for estimating. If the engineer begins with good project definition parameters, the expert system will provide specific quantities normally not available until the latter stages of design. By using the parametric engineering model, the engineer can analyze the model generated, specific quantities well before a specific design is conveyed to drawings. With relatively little time or manpower invested (compared to preparing design drawings for quantity estimating), the engineer can develop

Table 5-1
GENERIC MODELS

GROUP/MODEL NAME

ADMINISTRATIVE FACILITIES GROUP

GENERAL ADMINISTRATIVE FACILITY
COMMAND HEADQUARTERS FACILITY
DATA PROCESSING CENTER
GENERAL PURPOSE OPERATION FACILITY

COMMUNICATIONS FACILITIES GROUP

COMMUNICATIONS FACILITY MODEL
SATCOM CENTER
TELEPHONE EXCHANGE BUILDING

DINING FACILITIES

40 - 250 PERSON DINING FACILITY
251 - 650 PERSON DINING FACILITY
651 - 1000 PERSON DINING FACILITY
1001 - 1500 PERSON DINING FACILITY

DORMITORIES

ENLISTED
OFFICER O1 - O2
OFFICER O3 - UP

MAINTENANCE FACILITIES GROUP

AIRCRAFT AVIONICS SHOP
AIRCRAFT ENGINE I & R SHOP
BASE CIVIL ENGINEER COMPLEX
DEPOT MACHINE SHOP
MAINTENANCE SHOP
MISSILE ASSEMBLY AND MAINTENANCE BUILDING
NON-DESTRUCTIVE INSPECTION FACILITY
PRECISION MEASURING EQUIPMENT LAB
VEHICLE MAINTENANCE FACILITY

MAINTENANCE HANGARS GROUP

AIRCRAFT MAINTENANCE HANGAR (HIGH BAY)
AIRCRAFT MAINTENANCE HANGAR (MEDIUM BAY)
CORROSION CONTROL HANGAR (HIGH BAY)
FUEL SYSTEM MAINTENANCE HANGAR (MEDIUM BAY)

MEDICAL MODEL

Table 5-1--continued

STORAGE FACILITIES GROUP

- BASE SUPPLY COMPLEX
- COLD STORAGE FACILITY
- COVERED STORAGE
- GENERAL PURPOSE MAGAZINE
- HAZARDOUS MATERIAL STORAGE
- HIGH BAY WAREHOUSE
- STORAGE SHED
- TROOP SUBSISTENCE WAREHOUSE
- WAR RESERVE MATERIEL STORAGE

TEMPORARY LIVING FACILITY MODEL

USER-DEFINED

Table 5-2
FUNCTIONAL SPACE AREAS

DESCRIPTION

40 - 250 PERSON DINING FACILITY TOTAL
251 - 650 PERSON DINING FACILITY TOTAL
651 - 1000 PERSON DINING FACILITY TOTAL
1001 - 1500 PERSON DINING FACILITY TOTAL
ADMIN MODULE - LARGE
ADMIN MODULE - MEDIUM
ADMIN MODULE - SMALL
ADMINISTRATIVE MODEL TOTAL
AIR FORCE CLINICS
AIR LOCK
AIRCRAFT AVIONICS SHOP TOTAL
AIRCRAFT ENGINE I & R SHOP TOTAL
AIRCRAFT MAINTENANCE AREA
AIRCRAFT MAINTENANCE HANGAR (HIGH BAY) TOTAL
AIRCRAFT MAINTENANCE HANGAR (MEDIUM BAY) TOTAL
AIS ROOM (AVIONICS INTERMEDIATE STATION)
AUDITORIUM
AUXILIARY POWER ROOM
BASE SUPPLY COMPLEX TOTAL
BASE SUPPLY STORE INDIVIDUAL EQUIPMENT AND STORAGE
BATTERY STORAGE ROOM
BASE CIVIL ENGINEER COMPLEX TOTAL
BUILDING SUPPORT AREA
CALIBRATION/REPAIR AREA
CHILLERS AND FOOD PREP AREA
COLD STORAGE FACILITY TOTAL
COLD STORAGE FREEZER AREA-LARGE (15'-22' CLG HGT)
COLD STORAGE FREEZER AREA-SMALL (10'-14' CLG HGT)
COM. CTR./MESSAGE DIST/BCC OFFICE (SCIF)
COMMAND HEADQUARTERS FACILITY TOTAL
COMMUNICATIONS FACILITY MODEL TOTAL
COMPRESSOR BALANCE AREA
COOK AND CLEAN ROOMS
COOLER
CORROSION CONTROL HANGAR (HIGH BAY) TOTAL
COVERED AIRCRAFT ENGINE STORAGE
COVERED EXTERIOR ENTRYWAY
COVERED EXTERIOR LOADING DOCK
COVERED EXTERIOR LOADING DOCK W/LEVELER
COVERED STORAGE TOTAL
COVERED WALKWAYS AND SERVICE AREAS
DATA PROCESSING AREA (LARGE)
DATA PROCESSING CENTER TOTAL
DATA PROCESSING ROOM (SMALL)
DATA SUPPLY ROOM
DENTAL CLINIC
DEPOT MACHINE SHOP AREA

Table 5-2--continued

DEPOT MACHINE SHOP TOTAL
DEPOT MAINTENANCE ROOM
DINING AREA; 40-250 PERSON
DINING AREA; 251-650 PERSON
DINING AREA; 651-1000 PERSON
DINING AREA; 1000-1500 PERSON
ENGINE MAINTENANCE AREA
ENLISTED TOTAL
EXPOSURE ROOM
EXTERNAL TANK AND FUEL BLADDER MAINTENANCE
FACILITIES MANAGEMENT
FACILITY TOTAL
FILM PROCESSING, STORAGE AND LAB
FOOD INSPECTION LABORATORY
FOOD SERVICE
FUEL SYSTEM MAINTENANCE HANGAR (MEDIUM BAY) TOTAL
GENERAL PURPOSE MAGAZINE TOTAL
GENERAL PURPOSE OPERATIONS FACILITY TOTAL
HANGAR WORK DOCK AREA
HAZARDOUS MATERIAL STORAGE - ACETYLENE
HAZARDOUS MATERIAL STORAGE - ACID
HAZARDOUS MATERIAL STORAGE - CHEMICAL
HAZARDOUS MATERIAL STORAGE - FLAMMABLE
HAZARDOUS MATERIAL STORAGE - H.A.A.F.
HAZARDOUS MATERIAL STORAGE - LIME
HAZARDOUS MATERIAL STORAGE - OXYGEN/NITROGEN
HAZARDOUS MATERIAL STORAGE TOTAL
HIGH BAY WAREHOUSE TOTAL
INTERIOR LOADING DOCK W/EXTERIOR CANOPY
KITCHEN/WASH/STG/EMP FAC; 40-250 PERSON
KITCHEN/WASH/STG/EMP FAC; 251-650 PERSON
KITCHEN/WASH/STG/EMP FAC; 651-1000 PERSON
KITCHEN/WASH/STG/EMP FAC; 1000-1500 PERSON
LAUNDRY, STORAGE, AND MAID'S ROOM
LAUNDRY, STORAGE, VENDING
LIVING UNIT - TYPICAL (526 SF/UNIT)
LOGISTIC SYSTEMS ROOM
LOUNGE AND GAME ROOM
LUNCH ROOM
MAIL ROOM
MAINTENANCE SHOP TOTAL
MATERIAL CONTROL
MATERIAL CUTTING AREA
MECHANICAL
MECHANICAL AND ELECTRICAL ROOM - SMALL
MECHANICAL MEZZANINE
MECHANICAL, ELECTRICAL, & BLDG SUPPORT W/MEZZANINE
MECHANICAL, ELECTRICAL, & BUILDING SUPPORT
MEDICAL LOGISTICS
MEDICAL TOTAL

Table 5-2--continued

MISSILE ASSEMBLY AND MAINTENANCE BUILDING TOTAL
MISSILE LOADING AND UNLOADING
MISSILE MAINTENANCE
MISSILE SHOP AREA
MISSILE TESTING
MISSILE/MUNITION STORAGE
MOBILITY EQUIPMENT STORAGE
MUNITIONS STORAGE
NON-DESTRUCTIVE INSPECTION FACILITY TOTAL
NURSING
OBSTETRICAL
OFFICE - CLOSED OFFICE SPACE
OFFICE - HANGAR OFFICES
OFFICE - OPEN OFFICE SPACE
OFFICE - WAREHOUSE OFFICE SPACE
OFFICE SUPPLY ROOM
OFFICER O1 - O2 TOTAL
OFFICER O3 - UP TOTAL
OIL ANALYSIS LABORATORY
OPERATION SYSTEM ROOM
PAPER STORAGE ROOM
PATHOLOGY
PATIENT WELFARE
PENETRANT/MAGNETICS AREA
PHARMACY
PHOTO/AVTR AREA
PHYSICAL THERAPY
PICK-UP, DELIVERY, TRANSPORTATION, MGT, & BULK STG
PRECISION MEASURING EQUIPMENT LAB TOTAL
PUBLIC AREA - HANGAR
PUBLIC AREA - WAREHOUSE
QUARTERS - ENLISTED (544 SF/UNIT)
QUARTERS - OFFICER 03 - UP (494 SF/UNIT)
QUARTERS - OFFICER O1 - O2 (308 SF/UNIT)
RADIOLOGY
READY ROOM
RECEIVING AND SMALL DRY STORAGE
RECEIVING/STAGING AND LARGE DRY STORAGE
RECEIVING/STORAGE/BENCHSTOCK
REFRIG RECEIVING AREA
SATCOM CENTER TOTAL
SATCOM EQUIPMENT ROOM
SECURITY
SECURITY CORRIDOR
SECURITY SYSTEM CONTROL ROOM
SERVERY; 40-250 PERSON
SERVERY; 251-650 PERSON
SERVERY; 651-1000 PERSON
SERVERY; 1000-1500 PERSON
SHOP - BODY SHOP AND PAINT BOOTH

Table 5-2--continued

SHOP - CARPENTRY/TOOL
SHOP - ELECTRICAL/INSTRUMENT CONTROL
SHOP - GEAR BOX/AFTER BURNER/GRAPHITE SPRAY BOOTH
SHOP - HEAT & REFRIGERATION, A/C
SHOP - MACHINE SHOP AREA
SHOP - MASON SHOP
SHOP - PAINT SHOP
SHOP - PLUMBING SHOP
SHOP - SHOP AREA
SHOP - WELDING/METAL CUTTING
SHOP - WELDING/SHEET METAL
SOUND ABSORBING ROOM
STOCKROOM
STORAGE - GENERAL PURPOSE
STORAGE - HIGH DENSITY
STORAGE - SUPPORT SECTION
STORAGE - WRM STORAGE AREA
STORAGE AND ISSUE
STORAGE SHED (3-SIDED STG FACL)
STORAGE SHED TOTAL
STRIPPING PIT
SUPPORT SYSTEMS
SURGICAL
SYSTEM CONTROL ROOM (SHIELDED)
TAPE LIBRARY
TELEPHONE EQUIPMENT ROOM
TELEPHONE EXCHANGE BUILDING TOTAL
TIRE REPAIR, TIRE STORAGE AND DYNAMOMETER ROOM
TLF MODEL TOTAL
TOOL GRINDING AREA
TROOP SUBSISTENCE WAREHOUSE FACILITY TOTAL
UNINTERRUPTIBLE POWER SUPPLY ROOM
VAULT - CIP CONCRETE CABLE VAULT
VAULT - CLASSIFIED VAULT - TYPE A
VAULT - CLASSIFIED VAULT - TYPE B
VAULT - WEAPONS VAULT - TYPE A
VEHICLE GENERAL PURPOSE REPAIR AREA - LARGE
VEHICLE MAINTENANCE AND MATERIAL CONTROL ROOM
VEHICLE MAINTENANCE FACILITY TOTAL
WASH BAY AREA
WORK AREA
WRM STORAGE TOTAL

detailed specificity by manipulating and analyzing the expert system knowledge bases. To demonstrate this flexibility for analyses and decision making, no default values were changed below the assembly level for this case study.

## Generic Model

The modeling process is based on the assumption that the only data available are information gleaned from interviewing the client on his needs and desires in the facility. Based on the client's description that proposed typical rooms would have two single beds and a sink--no conversational/living area, the modeling was initiated with the selection of enlisted dormitories for the base line run. To make this base line run, the engineer needed only to select the model type (enlisted dormitories, see Table 5-1); select the closest geographic location (Tyndall AFB, FL); and input gross square footage. These three decisions are the only required parameters to fire the inference engine to produce detailed quantities and costs.

The gross square footage was estimated by summing four site blocks of 60 feet by 200 feet, plus 60 feet by 130 feet, plus 60 feet by 20 feet, plus 60 feet by 60 feet for a total estimate of 24,600 square feet. For this base line run, very few parameters were overridden by the engineer, based on discussions with the owner.

The knowledge bases and inference engine produced detailed assembly quantities, as shown in Appendix A, from

this minimum data. All values effected by the engineer's changes are annotated with an asterisk in the right margin. First the parameter, "STORIES ABOVE GRADE," which has a default of three, was changed to one. This change, in turn, automatically caused the parameters "FLOOR TO FLOOR HEIGHT BELOW GRADE" and "FLOOR TO CEILING HEIGHT BELOW GRADE" to become zero. Continuing to the next page of parameters, "ROOF STRUCTURE TYPE" is changed from light weight steel joists to load bearing wood trusses as indicated with the abbreviations "STEEL LITE JOIS" and "LOAD BEAR-TRUSS." "BAY SIZE/SPAN LENGTH" is changed from medium, "30-50 LF," to small, "0-30 LF." "ROOFING TYPE" is changed from structural standing seam metal roof to shingles, as indicated with "STND SEAM METL" and "SHINGLE." Load bearing masonry is chosen for the "EXTERIOR WALL TYPE" over the default of "BRICK VENEER." This run, admittedly not a nursing home, but, illustrative of minimum data needed to run the expert system and the resulting cost estimates, is included in Appendix A for illustrative purposes only and will not be discussed further.

## Generic Nursing Home Model

Further discussions with the owner/client indicated the need for additional functional spaces to develop a generic nursing home model (Appendix B). The owner also provided a general order of magnitude on sizes of the additional functional spaces. The base line selection of enlisted dormitories gave functional spaces of:

Covered walk ways and service areas

Laundry, storage, and maid's room

Lounge and game room

Mechanical, electrical, and building support

Enlisted quarters (554 sf/unit)

From the list in Table 5-2 (four pages), the engineer selects and adds:

Administrative Module--medium size,

Building support area,

Covered exterior entryway,

Dining area; 40-250 persons,

Nursing,

Closed office space, and

General purpose storage,

A summary of functional spaces estimated and their accompanying calculations are shown in Table 5-3. The estimated allocation of square footage is discussed in the same order found on the model "GSM DETAILED ESTIMATE REPORT" shown in Appendix B. On this report an asterisk is placed by every model default value overridden by the engineer. In addition, the system automatically places an asterisk by those values that were recomputed at the next level in the work breakdown structure. All space allocated by the model to "COVERED WALKWAYS AND SERVICE AREAS" was moved to "COVERED EXTERIOR ENTRYWAY." To transfer this space the engineer must make the value in "COVERED WALKWAYS AND SERVICE AREAS" zero. The functional space "COVERED

WALKWAYS AND SERVICE AREAS" includes loading docks and true service areas. For this nursing home, the exterior entryway is meant to be an ambulance entrance with no special equipment or service support. Thus, the functional space "COVERED EXTERIOR ENTRYWAY" better models the purpose of the space. "LAUNDRY, STORAGE, AND MAID'S ROOM" area was estimated to be the sum of three rooms, 20 feet by 20 feet each, for a total of 1,200 square feet. "LOUNGE and GAME ROOM" was estimated at 30 feet by 20 feet for a total of 600 square feet. "MECHANICAL, ELECTRICAL, AND BUILDING SUPPORT" is zeroed for this generic run because this project, as a private sector facility, will not include new mechanical, electrical, and building support space normally designed in military enlisted quarters which uses central steam and other base utility connections.

The largest portion of the square footage (7,760 square feet) was allocated to rooms and bathrooms for the living quarters. The Certificate of Need for this nursing home was based on 60 bed spaces--32 nursing and 28 Adult Congregate Living Facility spaces. The space allocation was calculated from the minimum of 10 feet by 10 feet space per person required by the state of Florida. The allocation assumed double occupancy for the 16 room--32 nursing spaces at 10 feet by 10 feet per occupant, (3,200 square feet); and shared bathrooms (16) at 5 feet by 8 feet (640 square feet); 28 single occupancy for the Adult Congregate Living Facility (ACLF) rooms at 10 feet by 10 feet (2,800

Table 5-3
GENERIC NURSING HOME SPACE ALLOCATIONS

| FUNCTIONAL SPACE | CALCULATIONS | TOTAL SQUARE FOOTAGE |
|---|---|---|
| Covered walk ways and service areas | | 0 |
| Laundry, storage, and maid's room | (3 ea)(20')(20') | 1,200 |
| Lounge and game room | (30')(20') | 600 |
| Mechanical, electrical, and building support | Addition to existing bldg--no special bldg support | 0 |
| Enlisted quarters | 60 Led Spaces and 44 Baths | |
| | (32 ea)(10')(10') | 3,200 |
| | (16 ea)(5')(8') | 640 |
| | (28 ea)(10')(10') | 2,800 |
| | (28 ea)(5')(8') | 1,120 |
| | | 7,760 |
| Administrative Module | (5 ea)(12')(12') (Chapel, Accounting, Staff sitting room, Bookkeeping, and Reception) | 720 |
| Building support area | 30% GSA minus restrooms (450 SF) | 5,850 |
| Covered exterior entryway | (24' long)(16' wide) | 384 |
| Dining area | (80')(40') | 3,200 |
| Nursing | (20')(20') | 400 |
| Closed office space | (16')(24')(Admin)+ (sec)(16')(10') | 544 |
| General purpose storage | (2 ea)(10')(20') | 400 |

square feet); plus 28 private bathrooms at 5 feet by 8 feet (1,120 square feet).

The owner requested three offices for accounting, bookkeeping, and general business; a chapel; staff sitting room; and a reception area approximately 12 feet by 12 feet each. For these areas, 720 square feet (6 areas at 12 feet X 12 feet) were allocated to "ADMIN MODULE-MEDIUM" from the additional function space listing. The "ADMIN-MEDIUM" functional space includes small restroom and circulation areas for typical administrative areas.

The function space area called "BUILDING SUPPORT AREA" is described as:

> This space type includes such spaces as lobbies, stairs, elevators, mechanical, and electrical rooms. Fixed corridors are required for general building circulation, restrooms, and janitor's closets. Most corridors are functionally required within other space types and should be considered as part of that space type. Walls are painted masonry and gypsum wallboard except for the restrooms which are ceramic tile. A portion of the wall finish is vinyl wall covering. The floors are mostly carpet. There is some vinyl tile floor. Ceramic tile floors are used in the restrooms. The lobby entrance floor is brick paver. The ceilings are mostly acoustical lay-in ceiling tiles. Painted gypsum board ceiling are provided in the mechanical rooms and restrooms (75).

This nursing home will be designed with a central corridor with rooms on both sides. From experience, the engineer assumed 30 percent of the total gross square footage can be allocated to building support area (6300 square

feet) to cover hallways and visitor restrooms outside the living quarters. All visitor restrooms will be allocated in the common areas, not by the patient rooms. These assumptions resulted in an estimated 5,850 square feet (6,300 square feet minus an estimated 450 square feet for visitor restrooms) to "BUILDING SUPPORT AREA."

The "COVERED EXTERIOR ENTRYWAY" was estimated to be 24 feet long by 16 feet wide ambulance entry door for an allocation of 384 square feet. The "DINING AREA" was estimated to be 80 feet by 40 feet for an allocation of 3200 square feet. "NURSING" was estimated at 20 feet by 20 feet for an allocation of 400 square feet. "CLOSED OFFICE SPACE" was estimated at 16 feet by 24 feet (384 square feet) for an administrators office and 16 feet by 10 feet (160 square feet) for a secretary office with a total allocation of 544 square feet. "CLOSED OFFICE SPACE" is distinguished from "ADMIN MODULE-MEDIUM" in that closed office space is area to be used for desk oriented jobs that are obscured by full height partitions (private offices)--not space open to support public interface as chosen previously for the chapel and accounting offices. "GENERAL PURPOSE STORAGE" was estimated at two rooms 10 feet by 20 feet for an allocation of 400 square feet. The total square footage for the generic nursing home run is 21,058 square feet.

After the initial square footage is allocated the engineer has the option to review and change all default

values proposed by the expert system. The line items marked with an asterisk in Appendix B indicate the changes made for this generic nursing home run. The chosen overrides of default values for this run can be summarized in two areas: adjusting the knowledge base of "BUILDING SUPPORT AREA" and adjusting for utility items provided by local utility companies rather than the contractor.

As discussed in the space allocation descriptions, the building support area in this nursing home is not meant to provide the same type of circulation nor the restrooms typically found in large open administrative buildings. Thus, the model was adjusted at multiple levels of the work breakdown system, shown in Appendix B. In the "BUILDING SUPPORT AREA," the number of standard interior doors (WBS 050201, page 183) were estimated at four vice a default value of eighteen. The number of fire doors (WBS 050204) were reduced from a default of ten to four. Interior windows (WBS 050301) were zeroed. These changes are also reflected in the facility totals. Tile and terrazzo wall finishes (WBS 060104, page 187) are zeroed because restrooms are removed. Painting to wall (WBS 060105) is raised by a comparable amount to square footage removed with the wall tile. The default carpeting (WBS 060205, page 188) is zeroed and replaced with vinyl tile as proposed by the owner in both the building support area and quarters (WBS 060204 and WBS 060205, page 191). Specialties (WBS 0701, page 194) in the building support area are

removed except for the room signs and directories. Plumbing (WBS 0804, page 198) in the building support area is also reduced to reflect removing the public restrooms. Janitor sinks and water coolers are accepted at the default level.

The major change in utilities is found in "ELECTRICAL" system (WBS 11, page 202). The main transformer and secondary power to the building are deleted because the local power company will provide power connections to the edge of the footprint. In the building support area branch wiring (WBS 110201, page 203) and lighting equipment (WBS 110202, page 203) are reduced to reflect removal of the public restrooms. Under "SPECIAL ELECTRICAL SYSTEMS," telephone systems (WBS 120103, page 206) and television systems (WBS 120107, page 206) are zeroed because the local utility company provides cabling and connections.

## Nursing Home Design Model

The third model (Appendix C) was made by reviewing the design specifications and taking the quantities at the assembly level from the design drawings provided by the architect. These design values were input to the model as overrides to the default values (marked with asterisks in Appendix C). This computer model of assembly quantities represents the maximum in specificity for this study. Although one would not normally use a model for this level of detail, this model was made to have a basis for direct

comparison of the generic nursing home values and the designed nursing home values. In addition, construction costs will be calculated on this model for direct comparison to the contractor's bid. These comparisons will be the basis for accuracy assessments.

## Analyses of Resulting Direct Cost

Table 5-4 compares the resulting direct costs between the nursing home design model (QTO) and the generic nursing home model. Table 5-5 compares results of the same models using dollars per square foot as the measure of merit. Tables 5-4 and 5-5 were built from the model output cost data found in Appendix C for the nursing home design (QTO) run and Appendix B for the generic nursing home model.

In System 01, SUBSTRUCTURE, the architect used an eight-inch concrete wall foundation to account for specific site slopes versus the generic spread footing chosen by the expert system for a typical site in northwest Florida (Tyndall AFB). The actual design slab on grade was 2,400 square feet larger than the assumed values in the generic model. The cost difference of $15,300 resulted largely from the increased labor to construct the eight-inch foundation wall ($10,300 more) and the combination of material and labor on the additional 2400 square feet of slab. The difference in dollars per square foot was only $0.20. Thus, the difference in this system is

caused by the difference in assumed square footage not costing.

In System 02, SUPERSTRUCTURE, the design (QTO) model costs of $104,400 was largely caused by material costs ($81,200) for the precast roof panels versus the $55,200 material costs of the wood trusses and load bearing interior walls for the generic model. Labor costs ($39,800) to construct the wood trusses and interior load bearing masonry walls from the generic model versus the design model labor ($13,200) to install precast roof panels offset the material costs for an overall difference of $5,100. The difference in dollars per square foot is -$0.27.

In System 03, ROOFING, the design model uses a mix of built-up roofing and shingle roofing, while the generic model only uses shingle roofing. The cost difference is largely caused by a larger roof (26,702 square feet versus 22,290 square feet) in the design model. The difference in dollars per square foot is -$0.18.

In System 04, EXTERIOR CLOSURE, $31,900 of the cost difference is caused by deleting the metal stud backup wall found in the generic model, because the design model only paints the concrete wall on the interior. An additional $17,300 is saved by deleting the pipe and brick railings chosen by the generic model. More (1,298 square feet more in the design model) square footage of gypsum plaster exterior soffits offset these savings by $3000, for a total

Table 5-4
DIRECT COSTS COMPARISON ($000)

| SYSTEM DESCRIPTION | QTO ($000) | GENERIC ($000) | DIFFERENCE ($000) | QTO VS GENERIC |
|---|---|---|---|---|
| 01 SUBSTRUCTURE | 109.5 | 94.2 | 15.3 | See Note 1 |
| 02 SUPERSTRUCTURE | 104.4 | 99.3 | 5.1 | See Note 2 |
| 03 ROOFING | 60.0 | 57.8 | 2.2 | See Note 3 |
| 04 EXTERIOR CLOSURE | 139.6 | 173.2 | -33.6 | See Note 4 |
| 05 INTERIOR CONST | 197.7 | 150.2 | 47.5 | See Note 5 |
| 06 INTERIOR FINISHES | 105.9 | 146.4 | -40.5 | See Note 6 |
| 07 SPECIALTIES | 41.5 | 23.8 | 17.7 | See Note 7 |
| 08 PLUMBING | 154.1 | 144.0 | 10.1 | See Note 8 |
| 09 H.V.A.C. | 147.1 | 103.1 | 44.0 | See Note 9 |
| 10 SPECIAL MECHANICAL | 27.2 | 24.3 | 2.9 | See Note 10 |
| 11 ELECTRICAL | 167.1 | 188.6 | -21.5 | See Note 11 |
| 12 SPECIAL ELECTRICAL | 24.0 | 35.5 | -11.5 | See Note 12 |
| 13 EQUIPMENT | .0 | 1.3 | -1.3 | See Note 13 |
| FACILITY TOTAL | 1,278.1 | 1,241.7 | 36.4 | |

Notes:

1 Site specific foundation, 8-inch masonry walls
2 Precast/prestressed roof panels
3 4500 sq ft larger
4 Delete metal stud backup wall, pipe/brick railings
5 Eight-inch CMU walls, but fewer doors
6 Floor and ceiling finishes
7 Handicap bath accessories and countertops
8 More piping, fixtures, and floor drains
9 Multiple package units
10 Larger building, more sprinklers
11 More panel boards, less expensive lights
12 Fewer heat detectors, change in HVAC
13 All equipment provided by owner

Table 5-5
DIRECT COSTS COMPARISON ($/SF)

| SYSTEM DESCRIPTION | QTO $/SF | GENERIC $/SF | DIFF $/SF | QTO VS GENERIC |
|---|---|---|---|---|
| 01 SUBSTRUCTURE | 4.67 | 4.47 | .20 | See Note 1 |
| 02 SUPERSTRUCTURE | 4.45 | 4.72 | -.27 | See Note 2 |
| 03 ROOFING | 2.56 | 2.74 | -.18 | See Note 3 |
| 04 EXTERIOR CLOSURE | 5.95 | 8.23 | -2.28 | See Note 4 |
| 05 INTERIOR CONST | 8.43 | 7.13 | 1.30 | See Note 5 |
| 06 INTERIOR FINISHES | 4.52 | 6.95 | -2.43 | See Note 6 |
| 07 SPECIALTIES | 1.77 | 1.13 | .64 | See Note 7 |
| 08 PLUMBING | 6.57 | 6.84 | -.27 | See Note 8 |
| 09 H.V.A.C. | 6.27 | 4.90 | 1.37 | See Note 9 |
| 10 SPECIAL MECHANICAL | 1.16 | 1.16 | .00 | See Note 10 |
| 11 ELECTRICAL | 7.12 | 8.96 | -1.84 | See Note 11 |
| 12 SPECIAL ELECTRICAL | 1.02 | 1.68 | -.66 | See Note 12 |
| 13 EQUIPMENT | .00 | .06 | -.06 | See Note 13 |
| FACILITY TOTAL | 54.48 | 58.97 | -4.49 | |

Notes:

1 Site specific foundation, 8"masonry wall
2 Precast/prestressed roof panels
3 4500 sq ft larger
4 Delete metal stud backup wall, pipe/brick railings
5 Eight-inch CMU walls, but fewer doors
6 Floor and ceiling finishes
7 Handicap bath accessories and countertops
8 More piping, fixtures, and floor drains
9 Multiple package units
10 Larger building, more sprinklers
11 More panel boards, less expensive lighting
12 Fewer heat detectors, change in HVAC
13 All equipment provided by owner

savings of $46,200 in the exterior walls construction. In exterior doors, the generic model selects six aluminum and glass doors with transoms and two hollow metal doors. The design model uses a total of ten hollow metal doors for a savings of $4,100 on exterior doors. In exterior windows, the design model uses an additional 691 square feet of sliding windows ($11,600) plus an additional 266 square feet of fixed windows ($5,100), causing an increase of $16,700. These three differences (-$46,200; -$4,100; and +$16,700) combined to cause the $33,600 savings difference shown in Table 5-4 between the design and the generic models. This results in an overall dollars per square foot for this system of -$2.28, one of the two significant cost differences.

In System 05, INTERIOR CONSTRUCTION, the design model costs $61,200 more, largely due to added costs of the eight-inch masonry block interior wall partitions. Hardwood handrails used in the design model add an additional $5,600 to the interior construction. The design model uses less expensive interior doors for an added savings of $19,100. There is no significant difference in interior windows (less than $100). The generic model selects one 4 foot X 4 foot aluminum roll up manually operated special door ($400) that the design model does not include. These differences accumulate to an increase of $47,500 in interior construction for the design model and result in a +$1.30 per square foot cost increase.

In System 06, INTERIOR FINISHES, the design model is $40,500 less because the architect chose more painted wall surfaces and less ceramic tile finishes. The design model uses vinyl instead of carpet in the hallways and the quarters/rooms and has no special pavers for the entry ways. Instead of those components chosen by the expert system, the design model uses less suspended ceilings and no exposed concrete finishes. The overall cost savings is -$2.43 per square foot.

In System 07, SPECIALTIES, the cost growth ($13,300) in the design model is caused by the need for handicap toilet accessories in the nursing home which are not used in the rooms of an enlisted dormitory. The design model includes additional metal base and wall cabinets. These changes make a +$0.64 per square foot change in this system.

In System 08, PLUMBING, the design model adds a booster pump and additional piping and fittings to the domestic water supply system (+$6,100, WBS 0801). In the sanitary waste and vent system (+$5,700, WBS 0802) the design model adds more floor drains and piping and fittings. Because the roof is designed with a slope, the design model deletes the rainwater drainage system (-$14,300, WBS 0803) chosen by the generic model. The need for handicap plumbing fixtures adds $12,800 to the design model costs in WBS 0804. These differences total to the increase of $10,100 in the plumbing for the design

model found in Table 5-4. In Table 5-5, the cost difference is -$0.27 per square foot.

In System 09, H.V.A.C. (Heating, Ventilation, and Air Conditioning), the design model uses individual room heat pumps, where the generic model chooses a central system. The design model doubles the costs (+$14,100) in ventilating and exhaust systems due to the added air exchanges required to control odors in a nursing home. These two design decisions result in added costs of $43,900 to the design model, and a change of +$1.37 dollars per square foot.

In System 10, SPECIAL MECHANICAL, the design model has additional fire sprinklers and fittings due to the increased square footage and greater number of rooms. There is no difference in dollars per square foot.

In System 11, ELECTRICAL, the design model uses more panel boards (+$17,200) but less expensive lighting (-$38,900) for an overall system saving of $21,500. The dollars per square foot difference is -$1.84.

In System 12, SPECIAL ELECTRICAL, the design model uses fewer heat detectors because the architect chose individual heat pump units instead of a central HVAC system with major duct work. The heat detectors are monitors in the duct work of the HVAC system. The cost difference in this system is a savings of $11,500, and a dollars per square foot difference of -$0.66.

In System 13, EQUIPMENT, the design model deleted the horizontal blinds as equipment furnishings chosen by the generic model. This change resulted in a cost savings of $1,300 and a reduction of $0.06 dollars per square foot.

## Analyses of Model Versus Contractor Costs

A copy of the contractor's estimated costs, as submitted for payment, can be found in Appendix E, "Application and Certificate for Payment, AIA Documents G702/G703," undated. In order to compare this cost schedule to the model costs, the model direct costs were converted to construction costs, and the contractor schedule was converted from Construction Specifications Institute (CSI) work breakdown categories to the UNIFORMAT work breakdown categories used by the models.

Direct costs calculated by the models are defined as those cost elements required to perform the actual construction of the project and generally include the on-site construction labor, materials, and equipment required to build the facility. Direct costs include Federal Insurance Contributions Act (FICA) costs, workman's compensation insurance, and small tools. Other items that may be included are the costs to transport the materials to the site and off-site fabrication of certain components. Construction costs are the combination of direct costs plus associated indirect costs (bonds, insurance, etc.) and contractor overhead and profit. Construction costs

were calculated using the Air Force Comparative method developed by the Construction Cost Management Directorate (75). The resulting construction costs are displayed in Appendix D.

The conversion of the contractor's payment schedule to UNIFORMAT work breakdown categories is delineated in Table 5-6 (2 sheets). The CSI format, commonly used by construction contractors, arranges cost items by trades and materials. The UNIFORMAT, commonly used by owners and engineers, arranges costs by building systems or, that is, by where the component is found in the building. To translate the contractor's estimate from the CSI to the UNIFORMAT categories, elements under item numbers found in Appendix E were separated and recompiled under appropriate categories as discussed below and shown in Table 5-6. Table 5-6 is organized with the UNIFORMAT System number and description in numerical order. The Contractor Payment Schedule descriptions, preceded by the item number as found in Appendix E, are listed under the UNIFORMAT categories.

System 01, SUBSTRUCTURE, is the combination of excavation and footings, soil testing, termite pretreating from item #2; plus transit mix concrete, reinforcing, formwork, finishes, and testing from item #3; plus vapor barrier/ damp from item #8.

System 02, SUPERSTRUCTURE, includes item #4, hollow core/precast slabs, and one element, structural/misc. steel, from item #6.

Table 5-6
CONTRACTOR PAYMENT SCHEDULE
CONVERSION CSI TO UNIFORMAT

| | | | |
|---|---|---|---|
| 01 | SUBSTRUCTURE | | |
| | 2 | EXCAVATION FOOTINGS | $9,252.00 |
| | 2 | SOIL TESTING | $2,000.00 |
| | 2 | TERMITE PRETREAT | $3,118.00 |
| | 3 | TRANSIT MIX CONCRETE | $55,694.00 |
| | 3 | REINFORCING | $17,582.00 |
| | 3 | FORMWORK | $9,650.00 |
| | 3 | FINISHES | $11,249.00 |
| | 3 | TESTING | $1,200.00 |
| | 8 | VAPOR BARRIER/DAMP | $4,626.00 |
| | | | $114,371.00 |
| 02 | SUPERSTRUCTURE | | |
| | 4 | HOLLOW CORE/PRECAST SLABS | $101,586.00 |
| | 6 | STRUCTURAL/MISC STEEL | $18,918.00 |
| | | | $120,504.00 |
| 03 | ROOFING SYSTEM | | |
| | 8 | ROOFING & SHEET METAL | $42,931.00 |
| | 8 | INSULATION | $1,120.00 |
| | 8 | CAULKING | $1,500.00 |
| | | | $45,551.00 |
| 04 | EXTERIOR CLOSURE | | |
| | 5 | CONCRETE MASONRY UNITS | $98,188.00 |
| | 5 | MORTAR | $5,447.00 |
| | 5 | MASONRY REINFORCING | $1,801.00 |
| | 5 | MASONRY INSULATION | $4,778.00 |
| | 5 | PRECAST WINDOW STOOLS | $9,819.00 |
| | 9 | METAL DOORS & FRAMES | $19,028.00 |
| | 9 | ALUMINUM WINDOWS | $19,399.00 |
| | | | $158,460.00 |
| 05 | INTERIOR CONSTRUCTION | | |
| | 6 | HANDRAIL BRACKETS | $2,885.00 |
| | 7 | ROUGH CARPENTRY | $93,667.00 |
| | 7 | FINISH CARPENTRY | $22.00 |
| | 9 | GLASS AND GLAZING | $2,000.00 |
| | 9 | FINISH HARDWARE | $19,802.00 |
| | 9 | WOOD DOORS | $21,374.00 |
| | | | $162,440.00 |

Table 5-6--continued

| | | | |
|---|---|---|---|
| 06 | INTERIOR FINISHES | | |
| | 11 | GYPSUM WALL BOARD | $37,887.00 |
| | 11 | CERAMIC TILE | $29,908.00 |
| | 11 | ACOUSTICAL CEILING | $7,776.00 |
| | 11 | RESILIENT FLOORING | $22,450.00 |
| | 11 | PAINT & WALL COVERING | $43,756.00 |
| | | | $141,777.00 |
| 99 | CONTRACTOR OVERHEAD AND PROFIT | | |
| | 12 | FIELD OVERHEAD COSTS | |
| | | 12 SUPERVISION | $29,016.00 |
| | | 12 CLEAN-UP | $5,017.00 |
| | | 12 OTHER | $16,763.00 |
| | | 12 INSURANCE | $2,400.00 |
| | | 12 BUILDING PERMIT | $2,000.00 |
| | 13 | PROFIT | $134,326.90 |
| | | | $189,522.90 |

System 03, ROOFING, includes three elements: roofing and sheet metal, insulation, and caulking from item #8.

System 04, EXTERIOR CLOSURE, includes all of item #5, masonry, plus two elements, metal doors and frames and aluminum windows, from item #9.

System 05, INTERIOR CONSTRUCTION, includes one element, handrail brackets from item #6; plus all of item #7, carpentry; plus three elements: glass and glazing, finish hardware, and wood doors from item #9.

System 06, INTERIOR FINISHES, includes five elements: gypsum wall board, ceramic tile, acoustical ceiling, resilient (vinyl) flooring, and paint and wall covering from item #11.

System 07, SPECIALTIES, is the sum of Miscellaneous specialties found in item #10.

System 08, PLUMBING, is the plumbing element found in item #11.

System 09, H.V.A.C., is the HVAC found under item #11.

System 10, SPECIAL MECHANICAL, is the automatic sprinklers found under item #11.

System 11, ELECTRICAL, is the electrical found under item #11.

System 12, SPECIAL ELECTRICAL SYSTEMS, has no counterpart in the contractor's payment schedule.

For System 99, CONTRACTOR OVERHEAD AND PROFIT, the overhead is the sum of elements in item #12, Field Overhead Costs. The Construction Fee in item 13 is the total

contractor profit for both the building construction and special site work. The site work was not included in this study, so the total construction fee of $1,680.945.00 was proportioned relative to the direct cost for building construction versus the direct costs for site work. This calculation resulted in $134,000.00 from item #13 being allocated to System 99 for profit. The total of overhead and profit for the comparisons in Table 5-7 and Table 5-8 is $189,523.00.

Table 5-7 summarizes the comparisons by total dollars between the model costs and the contractor's payment schedule. Table 5-8 provides the same comparisons in dollars per square foot.

## Summary

This case study was developed to demonstrate and analyze the accuracy of a knowledge-based parametric engineering cost modeling concept to predict construction costs of a facility. A nursing home, consisting of twelve different functional spaces, was chosen as a case example to demonstrate the knowledge-based system's ability to combine areas of diverse use.

The case study began with the selection of a "closest fit" model from a preprogrammed "shopping list." This model was modified to a generic nursing home model by adding new functional spaces and reallocating the gross square footage among the functional space areas. Using the expert

Table 5-7
NURSING HOME COST ANALYSIS

| | DESCRIPTION OF WORK | MODEL COST ($000) | CONTRACTOR ($000) |
|---|---|---|---|
| 01 | SUBSTRUCTURE | $114.4 | $114.4 |
| 02 | SUPERSTRUCTURE | $118.6 | $120.5 |
| 03 | ROOFING | $64.5 | $45.6 |
| 04 | EXTERIOR CLOSURE | $147.5 | $158.5 |
| 05 | INTERIOR CONSTRUCTION | $206.0 | $162.5 |
| 06 | INTERIOR FINISHES | $111.0 | $141.8 |
| 07 | SPECIALTIES | $47.1 | $28.7 |
| 08 | PLUMBING | $162.9 | $144.6 |
| 09 | HVAC | $158.4 | $123.5 |
| 10 | SPECIAL MECHANICAL SYSTEM | $31.7 | $27.8 |
| 11 | ELECTRICAL | $170.2 | $179.9 |
| 12 | SPECIAL ELECTRICAL SYSTEM | $25.0 | $.0 |
| 99 | CONTRACTOR OH & PROFIT | $167.0 | $189.5 |
| TOTAL | | $1,524.3 | $1,437.3 |

Table 5-8
NURSING HOME COST ANALYSIS

| | DESCRIPTION OF WORK | MODEL COST $/SF | CONTRACTOR $/SF |
|---|---|---|---|
| 01 | SUBSTRUCTURE | $4.88 | $4.87 |
| 02 | SUPERSTRUCTURE | $5.06 | $5.14 |
| 03 | ROOFING | $2.75 | $1.94 |
| 04 | EXTERIOR CLOSURE | $6.29 | $6.75 |
| 05 | INTERIOR CONSTRUCTION | $8.78 | $6.92 |
| 06 | INTERIOR FINISHES | $4.73 | $6.04 |
| 07 | SPECIALTIES | $2.01 | $1.22 |
| 08 | PLUMBING | $6.94 | $6.17 |
| 09 | HVAC | $6.75 | $5.26 |
| 10 | SPECIAL MECHANICAL SYSTEM | $1.35 | $1.19 |
| 11 | ELECTRICAL | $7.25 | $7.67 |
| 12 | SPECIAL ELECTRICAL SYSTEM | $1.07 | $.00 |
| 99 | CONTRACTOR OH & PROFIT | $7.12 | $8.08 |
| | | ===== | ===== |
| TOTAL | | $64.98 | $61.26 |

system, the engineer took less than an hour to develop the new generic nursing home model. Next, the engineer prepared a project specific cost estimate by taking the quantities at the assembly level from the design drawings and pricing those assemblies against the same cost data bases. This quantity estimate took over 32 man-hours of engineering time. For direct construction costs, the overall cost of the generic model was within $36,400 of the design model with a percent difference of only 2.8%.

In addition to accuracy, the important benefit of this modeling techniques was that the engineer had sufficient construction details to analyze the engineering reasons for the cost differences. This difference was due to the increase in square footage and a reduction of costs in finishes, materials, and construction methods. For construction costs, the difference between the model and the contractors payment schedule was only 6%.

This case study successfully demonstrated the substantial savings in time (one man-hour compared to 32 man-hours) and astounding level of accuracy that can be achieved estimating a complex construction project using a knowledge-based system. The study also demonstrated the capability of using the knowledge-based system for analyzing project decisions to the material, labor, and equipment levels of detail.

# CHAPTER 6
# CONCLUSIONS

## Analyses of Model Results

Expert Systems can be a valuable tool for design engineers and construction managers. At no time, however, can an expert system replace the engineer. The complexity and interrelationships to produce a site-specific design or manage a specific project requires the intimate attention of a qualified engineer. But, helping an engineer develop, maintain, and manage the cost of complex construction projects is a viable application of a computer-based expert system. Multiple measures of merit: Accuracy, Specificity, Timeliness, and User Friendliness, are used to support this conclusion.

Accuracy is the first measure of merit by which models are measured. Therefore, accuracy, measured by the percent difference between the model results and traditional estimating methods, will be the first measure discussed for the conclusions. Another factor of accuracy is how close a model can simulate a specific design solution. This factor, called "specificity" for this study, is important because it allows the engineer to interpret and explain changes in accuracy as the design progresses.

Equally important is the need for a model to be timely, both in the sense of the time required to complete an estimate compared to traditional methods, but more important to the design engineer or the construction manager is for a model to be timely to support decision making. Both of these timeliness issues will be discussed.

Unless a model is "user friendly" enough to be attractive to the engineer, the model will "die a natural death" from lack of use and lack of maintenance. Successful improvement to all these factors by this expert system contribute to the conclusion that this modeling approach is a viable application of expert systems needed in the construction industry.

Accuracy. As discussed in the methods and procedures, an industry-wide standard for acceptable levels of cost accuracy on construction projects does not exist. Thus, the "management flex" ($\pm$20% Of $1.5 million) required by the US Congress for Department of Defense Military Construction Appropriations is used for the measure of "goodness" for accuracy. The case study example with an overall accuracy of 6% for construction costs is certainly within the defined goodness measure. The resulting 2.8% for direct cost comparisons is even better.

The case study was provided to demonstrate the modeling methods, the estimating details that result, and the viability of the expert system to a private sector project.

In addition, the expert system has been tested on a variety of military projects. The results of these estimates are presented to demonstrate additional examples of accuracy testing. The accuracy test was conducted under rules commonly called a "blind test." Projects presented were selected by various construction management offices in the Department of Defense with no directions or control from this engineer. The engineer was provided only the initial project description prior to any design development. After the model estimate was completed, the engineer was provided the design estimate provided by traditional estimating methods at the 35% design stage and the fiscal close-out cost of the projects for comparison to the model estimates. The estimate at the 35% design stage was chosen because that is the estimate on which the projects were authorized for construction and most closely represents the estimate that the expert system was designed to produce. The fiscal close-out costs included change orders and represents the actual costs to occupy the building.

Table 6-1 lists the projects and the results. Column 1 is a project index number for numerical reference. Column 2 is a short title of the project. Column 3 is the fiscal close out cost of the project in thousands of dollars. Column 4 is the estimate provided by traditional estimating methods, in thousands of dollars, provided at the 35% design stage and was the cost on which the project

Table 6-1
ACCURACY COMPARISONS

| PROJECT NUMBER/DESCRIPTION | FINAL COST ($000) | TRADITIONAL ($000) | TRADITIONAL (% ACC) | MODEL EST ($000) | MODEL (% ACC) |
|---|---|---|---|---|---|
| 1 - Dormitory | 3925 | 3720 | -5.2% | 4000 | 1.9% |
| 2 - Dormitory | 6152 | 6900 | 12.2% | 7400 | 20.3% |
| 3 - Dormitory | 12035 | 14421 | 19.8% | 12600 | 4.7% |
| 4 - Dormitory | 15512 | 16288 | 5.0% | 15500 | -0.1% |
| 5 - Dormitory | 1759 | 1930 | 9.7% | 2250 | 27.9% |
| 6 - Child Care Center | 1706 | 2485 | 45.7% | 1900 | 11.4% |
| 7 - Child Care Center | 1737 | 2396 | 37.9% | 1700 | -2.1% |
| 8 - Classroom | 2535 | 3459 | 36.4% | 2400 | -5.3% |
| 9 - Classroom | 4190 | 5000 | 19.3% | 3900 | -6.9% |
| 10 - Gymnasium | 3055 | 2700 | -11.6% | 2600 | -14.9% |
| 11 - Gymnasium | 1467 | 1900 | 29.5% | 1700 | 15.9% |
| 12 - Education Center | 2145 | 2183 | 1.8% | 2150 | 0.2% |
| 13 - Aeromedical Tng | 1933 | 1420 | -26.5% | 1900 | -1.7% |
| 14 - Aeromedical Tng | 2091 | 1845 | -11.8% | 2150 | 2.8% |
| 15 - Ops Trainer Fac | 3538 | 3750 | 6.0% | 3000 | -15.2% |
| 16 - Flight Simulator | 1576 | 2589 | 64.3% | 1750 | 11.0% |
| 17 - Health Center | 1309 | 1917 | 46.4% | 1800 | 37.5% |
| 18 - Ocean Science Lab | 5458 | 8000 | 46.6% | 6700 | 22.8% |
| 19 - Base Operations | 1082 | 890 | -17.7% | 920 | -15.0% |
| 20 - Squadron Operations | 1218 | 1400 | 14.9% | 1350 | 10.8% |
| 21 - Acft Maint Shop | 2190 | 1859 | -15.1% | 2200 | 0.5% |
| 22 - CIDC Field Ops | 994 | 1056 | 6.2% | 1050 | 5.6% |
| 23 - Elec/Comm Shop | 2150 | 2200 | 2.3% | 3050 | 41.9% |
| 24 - Veh Maint Fac | 2636 | 3500 | -32.8% | 2300 | -12.7% |
| 25 - Equipment Maint | 3985 | 4283 | 7.5% | 3900 | -2.1% |
| 26 - Maint Dock | 6379 | 5630 | -11.7% | 6200 | -2.8% |
| 27 - Warehouse | 1724 | 2540 | 47.3% | 2050 | 18.9% |
| 28 - Admin & Supply | 1438 | 2013 | 40.0% | 1650 | 14.7% |
| 29 - CSOC | 90900 | 146800 | 61.5% | 91500 | 0.7% |
| Project Average | 6442 | 8796 | 23.9% | 6606 | 7.3% |

was authorized. Column 5 is the percent accuracy of traditional methods. Column 6 is the model estimate in thousands of dollars and Column 7 is the percent accuracy of the model estimate. Percent accuracy for traditional construction estimating methods ($A_{\%_T}$) is computed as the difference between the cost computed using traditional construction estimating methods ($C_T$) for each project (n) minus the final, fiscal close-out cost ($C_F$) for each project (n) divided by the final, fiscal close-out cost ($C_F$) for each project (n):

$$(A_{\%_T}) = \frac{(C_{T_n}) - (C_{F_n})}{(C_{F_n})}$$

Percent accuracy for costs computed using the parametric cost engineering models ($A_{\%_M}$) is computed as the difference between the cost computed using parametric cost engineering methods ($C_M$) for each project (n) minus the final, fiscal close-out cost ($C_F$) for each project (n) divided by the final, fiscal close-out cost ($C_F$) for each project (n):

$$(A_{\%_M}) = \frac{(C_{M_n}) - (C_{F_n})}{(C_{F_n})}$$

The average percent accuracy ($\bar{A}_{\%_T}$) using traditional construction estimating methods was computed by summing

the absolute value of the percent accuracy using traditional construction estimating methods ($A_{\%_T}$) for the n projects and dividing by the number of projects.

$$\bar{A}_{\%_T} = \frac{\sum_{i=1}^{n} |(A_{\%_T})|}{n}$$

The average percent accuracy ($\bar{A}_{\%_M}$) using parametric cost engineering models was computed by summing the absolute value of the percent accuracy using models ($A_{\%_M}$) for the n projects and dividing by the number of projects.

$$\bar{A}_{\%_M} = \frac{\sum_{i=1}^{n} |(A_{\%_M})|}{n}$$

The resulting project average for traditional methods is 23.9% over the final fiscal costs compared to 7.3% over the final costs computed using the parametric cost engineering methods.

An average for final, fiscal close-out costs of the projects ($\bar{C}_F$) was calculated as the sum of each project close out cost ($C_F$) divided by the number of projects (n).

$$\bar{C}_F = \frac{\sum_{i=1}^{n}(C_F)}{n}$$

An average for costs computed using traditional methods ($\bar{C}_T$) was calculated as the sum of each project traditional cost ($C_T$) divided by the number of projects (n).

$$\bar{C}_T = \frac{\sum_{i=1}^{n}(C_T)}{n}$$

An average for costs computed using models ($\bar{C}_M$) was calculated as the sum of each project model cost ($C_M$) divided by the number of projects (n).

$$\bar{C}_M = \frac{\sum_{i=1}^{n}(C_M)}{n}$$

Total dollar close out costs ($C_{D_F}$) for the projects was calculated as the sum of the close-out costs of the projects ($C_F$)

$$C_{D_F} = \sum_{i=1}^{n}(C_F)$$

Total dollar value of the projects using traditional construction estimating methods ($C_{D_T}$) was calculated as the sum of the traditional estimates of the projects ($C_T$)

$$C_{D_T} = \sum_{i=1}^{n}(C_T)$$

Total dollar value of the projects using the estimates from the model ($C_{D_M}$) was calculated as the sum of the model estimates of the projects ($C_M$)

$$C_{D_M} = \sum_{i=1}^{n}(C_M)$$

An overall average for total dollars estimated using traditional methods ($\bar{C}_{D_T}$) was calculated by the traditional estimates ($C_{D_T}$) sum minus the actual, final cost ($C_{D_F}$) sum divided by the actual, final cost ($C_{D_F}$) sum.

$$\bar{C}_{D_T} = \frac{\sum_{i=1}^{n}(C_{D_T}) - \sum_{i=1}^{n}(C_{D_F})}{\sum_{i=1}^{n}(C_{D_F})}$$

An overall average for total dollars estimated using models methods ($\bar{C}_{D_M}$) was calculated by the models estimates ($C_{D_M}$) sum minus the actual, final cost ($C_{D_F}$) sum divided by the actual, final cost ($C_{D_F}$) sum.

$$\bar{C}_{D_M} = \frac{\sum_{i=1}^{n}(C_{D_M}) - \sum_{i=1}^{n}(C_{D_F})}{\sum_{i=1}^{n}(C_{D_F})}$$

These calculations resulted in a dollar average for traditional estimating methods of 36.5% over the final costs. Calculations for the dollar accuracy for the model estimates gave a 2.5% accuracy of the estimates using parametric cost engineering models over the final cost.

Specificity. The ability of the engineer to adapt the knowledge bases or to create new knowledge bases to simulate an exact, specified design is the greatest advantage of the expert system in decision making. It is the ability to analyze the details of why a specific

design or design decision results in different cost that makes the engineering parameter modeling advantageous over traditional cost parameter modeling.

For example, in the case study, the ability to model the concrete wall foundation versus the generic spread footing gave insight into the site specific engineering rather than just the difference in subsystem cost factors. The ability to use an expert system to simulate alternative design solutions provides a valuable value engineering tool prior to design and a valuable analysis tool during or after design. It is particularly important in providing a tool to analyze special items that may not be costed separately. For example, in a specialized facility, designed to refurbish the compressor blades inside a jet engine, the design cost estimate was 35% over the expected cost. Using the expert system to compare the two cost estimates, the engineer was able to ascertain that the cost difference was caused by a requirement for 1250 tons of air conditioning in the mechanical load while the expected requirement was only 50 tons. Similarly, the electrical loads in the design cost estimate were 5600 amperes more than expected for the size of the facility. Table 6-2 shows the comparison between the expected results and the design calculations. By specifying the engineering reasons for the cost difference, the engineer could investigate a more correct engineering solution. In this particular example, the load increases over the expected were

Table 6-2
ENGINE COMPONENT REPAIR FACILITY

| COMPONENT | COST EXPECTED ($MIL) | DESIGNED ($MIL) |
|---|---|---|
| TOTAL | 11.5 | 8.50 |
| STRUCTURAL | (2.69) | (2.69) |
| ARCHITECTURAL | (2.14) | (2.14) |
| MECHANICAL (see note 1) | (1.67) | (2.90) |
| ELECTRICAL (see note 2) | (1.91) | (3.73) |

Notes:

1. Mechanical increased $1.2 million due to equipment load. (50 tons expected/1200 tons designed.)

2. Electrical increased $1.8 million due to equipment load increase of 5600 amperes.

caused by facility/equipment integration requirements due to special annealing ovens and computer controlled distribution systems. Neither the equipment manager nor the facilities manager had budgeted for the additional load requirements. By locating the specific engineering cause of the cost problem, the engineer convinced the budget officer that the design solution was correct and to provide the additional funds to construct the needed facility.

Timeliness. As discussed in the methods and procedures, time to perform a construction cost estimate is not readily measured. Often major components of the design are subcontracted or divided among several estimators either to share the work load or because estimators tend to become experts in a particular area. The estimating process often is performed in conjunction with other functions such as contacting suppliers or materials management. In many cases, particularly at the 35% design stage, an estimator will combine multiple estimating techniques. Quantity-take-off methods can be used if the design of a component is near completion. Traditional parametric cost estimating may be used if he has a large historic data base. It is not unusual for the estimator to use "lump sum" estimates at the 35% design stage to put a wedge in the budget for components yet to be designed. Regardless, traditional estimating using quantity-take-off procedures are inherently time consuming. For the case study, thirty-two man-hours were expended to take off quantities

from the design drawings at the assembly level. Substantially more time would be required for take-off at the line item level. In comparison, time to exercise the expert system, was measured in minutes.

Timeliness to support decision making, however, is the important time factor of an expert system. The ability to determine the cost impacts of "what ifs" at a detailed assembly level without the effort and expense of conveying a specified design to drawings is an asset to an engineer. Having knowledge of what a facility "should cost" is a valuable tool to analyze multiple bids or market impacts. Table 6-3 is an example of analyses that an expert system can provide. This table lists the allocations of total cost that one should find in components of a facility, listed by UNIFORMAT categories. For example, note that costs of specialties should be four times as much in child care centers than in administrative facilities.

The potential to respond to a client's "wish list" with informed and easily understood data is necessary to avoid surprises and potential cost overruns. Using the expert system modeling process is a good technique to elicit from an inexperienced client the desired facility needs and wishes. The list of preprogrammed generic models and functional spaces can be used as a "check list" to help an inexperienced client communicate his needs and to understand the potential costs of added features.

Table 6-3
SHOULD COST ALLOCATIONS

| UNIFORMAT BUILDING SYSTEM | WAREHOUSE | CHILD CARE CENTER | DINING FACILITY | ADMIN TYPE FACILITY | EDUCATION CENTER | REG MEDICAL CENTER |
|---|---|---|---|---|---|---|
| 01 - SUBSTRUCTURE | .266 | .165 | .104 | .068 | .101 | .031 |
| 02 - SUPERSTRUCTURE | .129 | .047 | .029 | .135 | .122 | .146 |
| 03 - ROOFING | .099 | .068 | .055 | .052 | .038 | .013 |
| 04 - EXTERIOR CLOSURE | .125 | .097 | .142 | .122 | .160 | .089 |
| 05 - INTERIOR CONST | .014 | .079 | .037 | .083 | .079 | .109 |
| 06 - INTERIOR FINISHES | .059 | .191 | .147 | .125 | .174 | .154 |
| 07 - SPECIALTIES | .042 | .019 | .000 | .011 | .013 | .061 |
| 08 - PLUMBING | .038 | .066 | .097 | .057 | .056 | .147 |
| 09 - HVAC | .095 | .111 | .283 | .175 | .100 | .118 |
| 10 - SPECIAL MECH SYS | .049 | .025 | .018 | .014 | .014 | .000 |
| 11 - ELECTRICAL | .077 | .112 | .080 | .142 | .118 | .078 |
| 12 - SPECIAL ELEC SYS | .007 | .020 | .008 | .013 | .025 | .025 |

User friendliness. The ease of use in this expert system was exemplified with the default run in Appendix A. The only input required is to select a "closest fit" model, provide gross square foot estimates, and select a location from the geographical location table. All parameters are prompted from the computer screen and can be made from on-line table selections, except the gross square footage. Square footage value is a required input (not screen choice) by the engineer. This system is so user friendly that almost anyone can run it. This, unfortunately, is a dangerous, false impression. An engineer exercising the expert system must make informed choices to result in valid cost estimates.

Exercising a model, selecting alternative values, and more importantly overriding a model value, require a good understanding of the assumptions and values on which the model is built. The engineer using this expert system needs to know parameters of the facilty he is costing as well as parameters on which the model was designed. As an example, one needed to know the "BUILDING SUPPORT AREA" in the functional space table was designed around large administrative facilities to recognize the need to delete space for restrooms when that space was added to the nursing home. On-line help screens provide definitions, clarifications, and instructions. Some checks are provided by the software computer displaying recalculated values, but it is not "dummy proof."

Although much effort has been made in the design of the expert system and in the supporting software, to make this model "user friendly," it cannot be over emphasized that the results are only as good as the engineer making the modeling input.

## Summary

To develop conclusions, this chapter tested the model against multiple measures of merit: Accuracy, Specificity, Timeliness, and User Friendliness. Under each measure of merit the results strongly supported the parametric cost engineering models over traditional construction cost estimating methods for predesign budget estimating.

In the case study, the modeling method with only general information of the facility requirements was within 2.8% of direct costs and 6% of construction costs of the traditional quantity-take-off at the assembly level. This model accuracy was achieved with less than one tenth the number of man-hours required using traditional methods and would have achieved even greater time savings if quantities had been taken off at the line item level. Twenty-nine other accuracy data points comparing fiscal close-out costs to budget estimates resulted in an average of 7.3% using parametric cost engineering models with no design drawings compared to 23.9% using traditional methods with design information normally found at the 35% design stage.

The case study analyses demonstrated that the models provide sufficient specificity to examine the engineering causes of cost difference. Traditional parametric cost estimating provides capabilities to analyze cost differences but are not specific enough to allow engineering analyses. The case study, particularly the model default run (Appendix A), demonstrated that the design is so user friendly that it gives a false impression that anyone can exercise the expert system. A qualified engineer is needed to answer the screen prompts and make the hard decisions on overriding the default values.

As stated in the Introduction, the objectives of this study--to develop a knowledge-based system for decision making in construction projects and demonstrate a private sector application of the cost-modeling process--have been achieved. In achieving these objectives, this study has provided valuable new methods in the construction industry.

# CHAPTER 7

# TOPICS FOR FUTURE RESEARCH

One of the hardest tasks in preparing a dissertation and conducting research is to define the scope of the subject into a tractable study that can be completed in a reasonable time period. Any subject studied in depth will branch into varied subdisciplines and related topics. This study, "Development Of A Knowledge-Based System Approach For Decision Making in Construction Projects," is no exception. Many side interests and subdisciplines emerged during the supporting research. This chapter will discuss six areas for potential future research: artificial intelligence fields, integration with graphics, systems integration, industry standards for a work breakdown system, a survey of private sector cost parameters, and the importance of proper contracts in construction management.

## Artificial Intelligence Fields

Artificial intelligence, with knowledge-based, expert systems as a subdiscipline, is an emerging research field that appears boundless. Harmon and Maus define artificial intelligence as an "academic research program" (45:4).

In her paper (42), Gregory surveyed many applications of expert systems in the broad field of cost analyses and special applications of expert systems in construction management. These will not be repeated herein, but the reader is encouraged to pursue these topics.

## Integration With Graphics

A major improvement to this and other expert systems would be the ability to display on-line schematic drawings of selections made and the impacts of those selections on the resulting model. This could vary from an initial capability to show line drawings of major components, such as spread footings, to "cut-aways" of roof design with insulation. On-line ties into suppliers or materials catalogs could be a future capability. Recent technology breakthroughs in digitizing camera images make three dimensional displays of even the line-item components a near term capability. The expert systems approach and "top-down" hierarchy for cost analyses demonstrated in this study could be integrated with Computer Aided Design and Drafting (CADD) systems to provide the graphics aspects and other engineering analyses. A caution is extended, however, to keep such an integrated system "user friendly" and small enough to manage. A major pitfall of integrated systems is the creation of such a large, complex, integrated computer model that the typical engineer does not have the time nor inclination to use it.

## Systems Integration

More research is needed to develop realistic methods to assure selections made by a user in one building system are reasonable in relation to other systems affected by that selection. For example, there needs to be better "checks and balances" to ensure a user of the model does not select a roofing system that cannot be supported by the superstructure chosen. Developing systems integration rules is not as easy as it may seem on first impression. Good engineers can develop unusual designs that do not fit generic rules. For example, a perimeter of a facility may be larger than the footprint if the facility is designed on a pedestal. An automated method of balancing the integration among building systems and components is a future research topic. Systems integration rules might also be an outgrowth of Computer Aided Design and Drafting (CADD) technologies.

## Industry Standard for Cost Work Breakdown System

An industry standard for classifying elements of a construction project is needed. The two most common work breakdown systems are the UNIFORMAT and CSI classification systems. As shown in the case study there is no easy or straight forward method of mapping the UNIFORMAT system to the CSI system. Furthermore, there is little consistency among the construction industry for classifying elements

within either system. The industry is more consistent with CSI than UNIFORMAT, but both need improvment. The ramifications of developing a standard involve more than cost estimating. Potential uses of a standard WBS include collecting historical data; improving data for parametric cost estimating; cost planning and cost control; value engineering; project scheduling analyses; life cycle costing; recording and managing maintenance schedules; component investment strategies (such as roof replacement scheduling); and materials, specification, or drawings cataloging/filing systems.

As a spinoff of this study, the Air Force with the U.S. Naval Facilities Command and the U.S. Army Corps of Engineers, as the Tri-Services Cost Engineering Committee, have begun efforts in this area under the jurisdiction of the American Society for Testing and Materials Committee E-6 on Performance of Building Construction and with responsibility to the Subcommittee E06.81 in Building Economics. Other interested parties on this committee are the National Institute of Standards and Technology, American Association of Cost Engineers, American Institute of Cost Engineers, Federal Construction Council, R.S. Means, and a variety of architectural/engineering consulting firms. The Tri-Services Cost Engineering Committee is committed to developing a common classification system. It appears the construction industry will join the commitment.

More work is needed in this area to adopt a national standard into all facets of construction management.

## Survey on Private Sector Cost Parameters

One initial, related topic that this study suggested was the development of a survey instrument to multiple respondent groups from the private sector to elicit and compare information on cost or budget-related problems to those of the public sector. Although this study concentrated on "The Development Of A Knowledge-Based System Approach for Decision Making in Construction Projects," the topic of surveying various private sector components remains an interesting research area. Other goals were to elicit specific project data or historic trends and use these data to develop cost parameters of special interest in the different components of construction-related industries. The concurrent (to this study) collapse of the savings and loan industry was related, in part, to poor investments in real estate and construction projects.

Responses to initial surveys discussed with selected engineers indicated high interest. Those selected engineers were from three components of the construction industry:

a. Financial Institutions and Lenders

b. Owners and Developers

c. Architect-engineers and owner representatives.

The plan was to distribute sufficient instruments to the three sets of potential respondents to establish a 90% confidence interval on responses. The first survey group consisted of members (approximately 1,200 across all aspects of the construction industry) of the National Institute of Building Science (NIBS) (59). This group was selected because, by joining NIBS, they demonstrated a desire to learn and incorporate emerging technologies in their day-to-day business. A second list consisting of financial institutions, developed from "Fleet's Guide To Commercial Real Estate, Financing Source Book," (38) was planned to be surveyed to ensure the models developed would incorporate parameters important to the construction backers. The Sustaining Members of the Society of Military Engineers (SAME) (69), the third response group, crossed all aspects of the construction industry and had both military and commercial construction experience. The SAME list of respondents was planned to be used to elicit and correlate differences between cost information required for commercial backing versus information required for budget submittals to Congress. The U.S. Environmental Protection Agency, Remedial Design/Remedial Action Conference proceedings, Dallas meeting mail list (84) also was reviewed to ensure the survey included some of the respondents from this new field of construction costing.

If required, based on the information from the responses, a modified Delphi (The RAND Corporation,

Helmer, 1968) technique was planned to attain consensus from the individual respondents. The plan recognized that application of the Delphi technique may have required multiple surveys of the respondents. Survey responses would have been to identify the underlying parameters which owners, construction industry members, and financial backers use to assess the feasibility of projects. An analysis of differences between construction cost information required for commercial financial backing versus cost information required for military construction Congressional budget submittals was planned as a special interest item. Analyses of differences and development of model parameters that drive the financial or budgeting decisions in the commercial sector of the construction industry were planned as outputs of this topical study.

The interest shown, from engineers with whom the survey plan was discussed, was very positive. However, even these few discussions opened a myriad of related areas for topical studies. Some of those related topics included analyzing the importance the lender places on the applicant's return on investment (financial viability) plan versus the independent appraisals of the cost of construction projects, analyzing the disparity between private sector and government practices in budgeting and managing construction costs, and the analysis of changing criteria on a construction estimates. One respondent suggested an investigation into the possibility that the government is

a more effective buyer of design and construction on new projects but loses that value to cumbersome contractual and accounting requirements. One of the more positive suggestions for future research was to investigate the "good news" projects and determine the parameters of a "right" project. Methods to incorporate real-time market fluctuations into ongoing large, complex construction projects was another interesting subject branch. Many of the projects contributing to the collapse of the savings and loan industry seemed financially viable when they were conceptualized. Finally, some engineers suggested that private sector projects are "schedule driven" and exactness of construction cost projections are obviated by benefits of bringing the projects to early completion.

## Importance of Proper Contracts in Construction Management

Selecting an appropriate contracting strategy is one of the most crucial items in construction management today. The whole delivery strategy, from requirement definitions, conceptual planning, design development, construction, and operations/maintenance of the finished project is bounded by one's ability to communicate the owner's desires in precise terms, at least precise enough to accomplish his goals. The proper contract is the means to reach those real goals.

The goal of construction contracts can be defined as balancing the three goals of cost, quality, and schedule.

These three elements often conflict and trade-offs must be made. It is through the contract strategy that the owner communicates his desired balance. There are many contract options available today. Yet, the stipulated sum (firm-fixed price), lowest bidder contract continues to dominate the construction industry. Many issues are involved when selecting the proper contract for a specific project. Studies in this topic related to cost analyses for decision making could concentrate on three issues in selecting the proper contract: cost of contractual arrangements, risk management, and vendor/constructor contracting strategies.

Cost of contractual arrangements. Construction projects are becoming more complex, thus contractual arrangements are becoming more involved. The importance of proper contracts is driven both by the litigious nature prevalent in our society and newly emerging contractual relationships and specialties among the members of the construction community (owners, architects, and contractors as well as construction managers and design-build contractors). Because of these changes, legal costs have been rising in the construction industry. The Business Round Table estimated "from a representative sample of major owners and contractors . . . the way construction contracts are written can add about 5% to the cost of typical projects." (22:58)

The American Institute of Architects (AIA) has taken steps to help members and the construction industry manage these growing costs by publishing standard forms, clauses,

and definitions. Even with these standards, AIA advises their users to "consult an attorney before completing an AIA document." (10:2) AIA further acknowledges the rising costs of litigating contractual language by incorporating "ARBITRATION by adoption of AIA Document A201, which provides for Arbitration according to the Construction Industry Arbitration Rules of the American Arbitration Association. Arbitration is BINDING AND MANDATORY in most states and under the federal Arbitration Act." (10:1) Arbitration contrasted to litigation would be an interesting and needed research area.

In the past, construction estimators have given little or no thought to the cost of contract language and its potential to drive traditionally estimated costs outside acceptable bounds. Different contractual languages even in the standard clauses or "boilerplate clauses" can yield contract provisions that can range from minor impact to bankruptcy for the contractor or the owner (21:16). A comparison by The Business Round Table of three different indemnity clauses commonly found in standard contracts showed that costs could range from no dollar limit on a contractor's exposure to minimal exposure limited to whatever could be collected form the contractor's insurance company (22:35-37).

Risk management. One of the basic goals of selecting the proper contract is to achieve an equitable balancing of risk. Transferring all risk to the contractor will

drive up the cost of insurance and other costs of doing business, such as limiting the bid market or competitive base. In contrast, a full reimbursable contract that transfers total risk to the owner leaves no incentive for the contractor to control cost growth and could drive the cost beyond acceptable limits. Use of proper contract strategy is the means to obtain an equitable and prudent sharing of risks. A strategy for project delivery must include contracting plans for risk management and risk sharing in the very early stages of requirements definition. It is this strategy that defines the type of contract and contract clauses needed, rather than trying to force a fixed contract form to accomplish conflicting goals. The contract should be based on principles of risk management in which the owner's and contractor's goals are mutually considered (23:58). Only well thought out contractual strategies can achieve this delicate balance of risk management.

Use of a proper contract strategy is essential to achieve and balance the conflicting goals of quality, cost, and schedule inherent in all construction contracts. Concepts of equitable risk sharing can only be implemented through carefully worded contractual clauses acceptable by all involved parties. Managing risks also manages costs. Legal costs and our society's propensity for litigation will not decrease; therefore, it is necessary for the prudent construction manager to recognize the impact of

carefully selected contract methods and carefully worded contract clauses as major elements of project delivery.

Vendor/constructor contracting strategies. Using a vendor/constructor contracting strategy in lieu of traditional design/bid/build contracting combinations is an emerging option that deserves much interest and research. Future applications for such a strategy can be found in the environmental cleanup problems. For example, designing the system and process for pumping and treating underground contaminated water reservoirs could be a combination of the pumping equipment vendor and the civil/environmental engineers. Even in building construction, many of the complex, computerized buildings components today incorporate major manufactured systems: curtain walls, elevators, ceiling lighting systems, partitions, raised floors, hardware, telecommunications, and complex environment control systems. Involvement of the manufacturers and vendors in the installation of complex manufactured systems is far smarter than trying to force traditional detailed specifications on off-the-shelf products (48). Many subjects in these volatile topic areas deserve future research.

## Summary

Construction Management is a field ripe for future research. Even in this attempt to discuss only six areas for future research, the topics became so multifaceted that the potential related topics outnumbered the basic subject areas. Construction management is also an area where basic research has the potential for major economic payoffs. Future research work should expand to integrating diverse fields, such as legal, political sciences, contracting, and business management, into the construction management improvements.

## GLOSSARY

ARTIFICIAL INTELLIGENCE (AI). AI is "an academic research program" (45:4) that covers a continuum of computer techniques and emerging tools with many overlapping applications designed to simulate the thinking, reasoning, and learning of the human mind.

CONSTRUCTION COSTS. Construction costs are the combination of direct costs plus associated indirect costs (bonds, insurance, etc.) and contractor overhead and profit.

DIRECT COSTS. Direct costs are defined as those cost elements required to perform the actual construction of the project and generally include the on-site construction labor, materials, and equipment required to build the facility. Direct costs include FICA, workman's compensation insurance, and small tools. Other items that may be included are the costs to transport the materials to the site and off-site fabrication of certain components.

EXPERT SYSTEM. A computer program that manifests some combination of concepts, procedures, and techniques to allow people to design and develop computer systems that use knowledge and inference techniques to analyze and solve problems (45:4-5). Expertise often consists of massive amounts of factual information coupled with rules-of-thumb, simplifications, rare facts, and wise procedures all compiled in a way that allows the expert to analyze specific types of problems in an efficient manner. (42 and 45)

INFERENCE ENGINE. That portion of an expert system that contains the inference and control strategies. More broadly, the inference engine also includes various knowledge acquisition, explanation, and user-interface subsystems. (44 and 45)

KNOWLEDGE ACQUISITION. The process of locating, collecting, and refining knowledge. This may require interviews with experts, research in libraries, compilations of regulations or design criteria, and field inspection. (44 and 45)

KNOWLEDGE BASE. A knowledge base is specially structured assimilation of expert judgments, historical data, algorithms, engineering principles, building codes, regulations, and statistical methods that can be manipulated and combined automatically in an expert system. Both knowledge bases and traditional data bases are designed to store information, but they differ significantly in the types of information they store and the interrelationships among the data they can handle. (14 and 42)

PARAMETRIC ESTIMATING. Parameter is defined by Webster's Seventh New Collegiate Dictionary (Merriam Company, 1970) as "one of a set of physical properties whose values determine the characteristic or behavior of a system." Parametric cost estimating, generally shortened to parametric estimating, is a process of forecasting costs of a future system by analyzing a set of physical parameters and establishing their relationship to the cost of the overall system. These relationships are called Cost Estimating Relationships (CERs) in the general definition of parametric cost estimating.

COMPARATIVE ESTIMATING Comparative estimating is the process of projecting future costs based on historical cost data. The term literally comes from "comparing" to previously built facilities. In the construction industry, comparative costs are generally collected at the total facility level, as in terms of dollars per square foot, and are manipulated through regression analyses or factor analyses to develop parameters and CERs for forecasting new buildings. The parameters may be the type of construction, such as steel or concrete superstructure, or in more sophisticated models, parameters may break the total costs into the building systems components to determine the cost relationships to the total building costs.

PARAMETRIC COST ENGINEERING. The modeling process developed by this study that translates project requirements through engineering parameters into construction quantities to price against unit cost data bases. In parametric cost engineering the forecasting is based on engineering parameters to estimate quantities of material, labor, and equipment that are then priced on current unit cost data--not based on historic cost parameters.

PLANNING ESTIMATE. A planning estimate is a forecast of the cost of a project before definitive drawings are prepared. For this study, a planning estimate is developed based on project definition parameters rather that detailed design of a specific engineering solution. A planning estimate may extend into the initial design phases (not to exceed the 35% design stage) if some design is required to support project definition. A planning estimate is used

to determine economic feasibility of the project, economics of alternative engineering solutions, and support budget submittals.

PREDESIGN ESTIMATE. Within this study, predesign estimates and planning estimates are the same.

QUANTITY-TAKE-OFF ESTIMATING (QTO). QTO estimating is the process of counting every component of a design at the "nuts and bolts" level of detail and pricing these components with unit price data bases. The term literally comes from counting (measuring the quantities of) material from completed detailed designs (taking off the drawings). By definition, the design drawings must be near complete (100 %) to get a "good" QTO estimate.

THIRTY-FIVE PERCENT (35%) DESIGN. Thirty-five percent (35%) design is a stage in design of a construction project. U.S. Congressional language has required this level of design prior to submission by the military departments for budget authorization or appropriation on construction projects under the Military Construction Program (3300 line appropriation.) A detailed definition of 35% design was given in U.S. Congressional Budget Authorization language by describing the characteristics of a project that is at the 35% design level. Those characteristics included a requirement for preliminary drawings, specifications in outline form, site plans, floor plans, elevations, finish schedules, tabulation of net areas for spaces limited by criteria or program, a cost with reasonably accurate take-off of the quantities or lump sum costs based on available data and many other detailed criteria.

VALUE ENGINEERING. Value engineering is a structured engineering process whose goal is to determine the best combination of engineering solutions to optimize user expectations for the least cost. In theory, value engineering should consider all solutions, engineering and otherwise, prior to design start. In practice, value engineering is delayed to at least 35% design stage and is most often conducted only after the project is in financial difficulty. At that point, it is more "devalue engineering" and redesign is undertaken for the specific purpose of reducing cost regardless of value lost.

WORK BREAKDOWN STRUCTURE (WBS). WBS is a structured hierarchy to breakdown a complex system into logical components. For this study two WBSs are used to define cost categories. The UNIFORMAT, developed by the U.S. Government General Services Administration, develops cost categories of building components based on where they are found in the facility, such as roofing or exterior closure

systems. The Construction Specifications Institute (CSI) MASTERFORMAT WBS divisions are organized around trade/labor categories and material suppliers such as concrete or steel. For example, concrete may be found in the substructure, superstructure, and roofing system of the UNIFORMAT but is all grouped in Concrete in the CSI.

# APPENDIX A

# GENERIC DORMITORY MODEL

GENERIC DORMITORY MODEL, INPUT PARAMETERS, DEFAULT RUN

| | UM | MODEL/ESTIMATED QUANTITY | USER QUANTITY |
|---|---|---|---|
| **MINIMUM PARAMETERS:** | | | |
| GROSS FLOOR AREA | SF | 24600 | 24600 |
| MODEL FULL SCOPE | SF | 24000 | 24000 |
| MODEL HALF SCOPE | SF | 600 | 600 |
| PROJECT TOTAL SCOPE | SF | 24300 | 24300 |
| PROJECT FULL SCOPE | SF | 24000 | 24000 |
| PROJECT HALF SCOPE | SF | 300 | 300 |
| STORIES ABOVE GRADE | ST | 3 | 1 * |
| **LOCATION MODIFIERS:** | | | |
| SEISMIC ZONE | NA | 0 | 0 |
| A/C WEATHER ZONE | NA | B | B |
| HEATING/INSULATION ZONE | NA | C | C |
| FROST LINE DEPTH | IN | 2 | 2 |
| **FUNCTIONAL SPACE AREAS:** | | | |
| COVERED WALKWAYS AND SERVICE AREAS | SF | 600 | 600 |
| LAUNDRY, STORAGE, AND MAID'S ROOM | SF | 1642 | 1642 |
| LOUNGE AND GAME ROOM | SF | 1520 | 1520 |
| MECHANICAL, ELECTRICAL, & BUILDING SUPPORT | SF | 2283 | 2283 |
| ENLISTED QUARTERS (544 SF/UNIT) | SF | 18555 | 18555 |
| **QUANTITY PARAMETERS:** | | | |
| FLOOR TO FLOOR HEIGHT ABOVE GRADE | FT | 9 | 9 |
| FLOOR TO FLOOR HEIGHT BELOW GRADE | FT | 12 | 0 * |
| FLOOR TO CEILING HEIGHT ABOVE GRADE | FT | 8 | 8 |
| FLOOR TO CEILING HEIGHT BELOW GRADE | FT | 9 | 0 * |
| FOOTPRINT | SF | 24600 | 24600 |
| AIR CHANGES PER HOUR | ACH | .34652 | .34652 |
| PLUMBING DOMESTIC WATER SUPPLY | EA | 121 | 121 |
| PLUMBING SANITARY WASTE SYSTEM | EA | 127 | 127 |
| PERIMETER | LF | 1192 | 1192 |
| ROOF AREA | SF | 26039 | 26039 |
| EXTERIOR WALL AREA | SF | 11522 | 11522 |
| EXTERIOR WINDOW AREA | SF | 849 | 849 |
| HEATING LOAD | MBH | 297 | 297 |
| COOLING LOAD | TONS | 23.57 | 23.57 |
| ELECTRIC LOAD | AMPS | 522 | 522 |
| EXTERIOR DOORS | EA | 16 | 16 |
| **DESCRIPTIVE PARAMETERS:** | | | |

* THIS VALUE WAS INPUT BY THE USER.

GENERIC DORMITORY MODEL, INPUT PARAMETERS, DEFAULT RUN

| | UM | MODEL/ESTIMATED QUANTITY | USER QUANTITY |
|---|---|---|---|
| **DESCRIPTIVE PARAMETERS:** | | | |
| SOIL TYPE | | AVG BEARING CAP | AVG BEARING CAP |
| FLOOR STRUCTURE TYPE | | N/A | N/A |
| ROOF STRUCTURE TYPE | | STEEL LITE JOIS | LOAD BEAR-TRUSS * |
| BAY SIZE / SPAN LENGTH | | 30 - 50 LF | 0 - 30 LF * |
| STAIR TYPE | | N/A | N/A |
| ROOFING TYPE | | STAND SEAM METL | SHINGLE * |
| EXTERIOR WALL TYPE | | BRICK VENEER | CONCRETE BLOCK * |
| HEAT GENERATING SYSTEMS | | WATER BOILR GAS | WATER BOILR GAS |
| COOLING GENERATING SYSTEMS | | RECIPROC CHILLR | RECIPROC CHILLR |
| **DENSITY PARAMETERS - FSA:** | | | |
| INTERIOR PARTITIONS - LAUNDRY, STORAGE & MAID RM | SF | 791 | 791 |
| INTERIOR DOORS - LAUNDRY, STORAGE & MAID RM | EA | 2 | 2 |
| INT WALL FINISH - LAUNDRY, STORAGE & MAID RM | SF | 3250 | 3250 |
| PLUMBING FIXTURES - LAUNDRY, STORAGE & MAID RM | EA | 13 | 13 |
| INTERIOR PARTITIONS - LOUNGE AND GAME ROOM | SF | 396 | 396 |
| INTERIOR DOORS - LOUNGE AND GAME ROOM | EA | 2 | 2 |
| INT WALL FINISH - LOUNGE AND GAME ROOM | SF | 2274 | 2274 |
| PLUMBING FIXTURES - LOUNGE AND GAME ROOM | EA | 5 | 5 |
| INTERIOR PARTITIONS - MECH, ELEC & BLDG SUP | SF | 547 | 547 |
| INT WALL FINISH - MECH, ELEC & BLDG SUP | SF | 772 | 772 |
| INTERIOR PARTITIONS - ENLISTED QUARTERS | SF | 37533 | 37533 |
| INTERIOR DOORS - ENLISTED QUARTERS | EA | 205 | 205 |
| INT WALL FINISH - ENLISTED QUARTERS | SF | 70399 | 70399 |
| PLUMBING FIXTURES - ENLISTED QUARTERS | EA | 136 | 136 |

* THIS VALUE WAS INPUT BY THE USER.

GENERIC DORMITORY MODEL, INPUT PARAMETERS, DEFAULT RUN

| | | UM | MODEL/ESTIMATED QUANTITY | USER QUANTITY |
|---|---|---|---|---|
| 01 | SUBSTRUCTURE | | | |
| 0101 | STANDARD FOUNDATION | SF | 24,600.000 | 24,600.000 |
| 0101 01 | WALL FOUNDATIONS | LF | 4,907.000 | 4,907.000 |
| 0101 0102 | 1' X 2' STRIP FOOTING, 3,000 PSI | LF | 687.000 | 687.000 |
| 0101 0103 | 1'0" X 3'0" STRIP FOOTING 3000 PSI | LF | 2,110.000 | 2,110.000 |
| 0101 0131 | 15" THICK CONRETE FOUNDATION WALL 4000 PSI, 16" DEEP | LF | 2,110.000 | 2,110.000 |
| 0101 02 | COLUMN FOUNDATIONS & PILE CAPS | SF | 24,600.000 | 24,600.000 |
| 0101 0201 | SPREAD FOOTING | CY | 17.000 | 17.000 |
| 0101 0241 | SPREAD FTG, REINFORCING STEEL | TONS | 1.000 | 1.000 |
| 0101 0277 | SPREAD FTG COL BOLTS | EA | 246.000 | 246.000 |
| 0102 | SPECIAL FOUNDATION CONDITIONS | SF | 24,600.000 | 24,600.000 |
| 0102 01 | PILE FOUNDATIONS | SF | 24,600.000 | 24,600.000 |
| 0103 | SLAB ON GRADE | SF | 24,600.000 | 24,600.000 |
| 0103 01 | STANDARD SLAB ON GRADE | SF | 24,600.000 | 24,600.000 |
| 0103 0102 | 5" STANDARD SLAB ON GRADE | SF | 24,600.000 | 24,600.000 |
| 02 | SUPERSTRUCTURE | | | |
| 0202 | ROOF CONSTRUCTION | SF | 26,039.000 | 26,039.000 |
| 0202 01 | STRUCTURAL FRAME | SF | 26,039.000 | 26,039.000 |
| 0202 0130 | WOOD TRUSS ROOF FRAMING W/ 3/4" PLYWD ROOF DECK | SF | 26,039.000 | 26,039.000 |
| 0202 02 | STRUCTURAL INTERIOR WALLS | SF | 12,943.000 | 12,943.000 |
| 0202 0203 | 8" INTERIOR LOAD BRG CONCRETE MASONRY UNIT WALL | SF | 12,943.000 | 12,943.000 |
| 03 | ROOFING | | | |
| 0301 | ROOFING | SF | 26,039.000 | 26,039.000 |
| 0301 01 | ROOF COVERINGS | SF | 26,039.000 | 26,039.000 |
| 0301 0105 | STRIP SHINGLES, 4" SLOPE, MULTI-LAYERED, CLASS A | SF | 26,039.000 | 26,039.000 |
| 0301 03 | ROOF INSULATION & FILL | SF | 26,039.000 | 26,039.000 |
| 0301 0307 | 1" RIGID INSULATION (2 LAYERS) | SF | 26,039.000 | 26,039.000 |
| 0301 04 | FLASHINGS & TRIM | SF | 2,113.000 | 2,113.000 |
| 0301 0405 | MISC. ROOFING ITEMS - 12" GRAVEL STOP | LF | 2,113.000 | 2,113.000 |
| 04 | EXTERIOR CLOSURE | | | |
| 0401 | EXTERIOR WALLS | SF | 11,522.000 | 11,522.000 |
| 0401 01 | EXTERIOR SKIN | SF | 10,355.000 | 10,355.000 |
| 0401 0110 | 8" LOAD BEARING CONCRETE BLOCK EXTERIOR CLOSURE WALL | SF | 10,355.000 | 10,355.000 |
| 0401 02 | INSULATION & VAPOR BARRIER | SF | 10,355.000 | 10,355.000 |

GENERIC DORMITORY MODEL, INPUT PARAMETERS, DEFAULT RUN

| | | UM | MODEL/ESTIMATED QUANTITY | USER QUANTITY |
|---|---|---|---|---|
| 0401 0201 | POLYSTYRENE RIGID WALL INSULATION, 1" THICK | SF | 10,355.000 | 10,355.000 |
| 0401 03 | INTERIOR SKIN | SF | 11,522.000 | 11,522.000 |
| 0401 0301 | 3 5/8" MTL. STUD NON-LOAD BEARING INTERIOR SKIN | SF | 9,649.000 | 9,649.000 |
| 0401 0304 | REINFORCED 8" CONCRETE MASONRY UNIT BACK-UP WALL | SF | 1,873.000 | 1,873.000 |
| 0401 05 | EXTERIOR LOUVERS & SCREENS | SF | 38.000 | 38.000 |
| 0401 0501 | FIXED BLADE EXTERIOR LOUVER WITH BAKED ENAMEL FINISH | SF | 38.000 | 38.000 |
| 0401 07 | BALCONY WALLS & HANDRAILS | LF | 541.000 | 541.000 |
| 0401 0701 | 9" SOLID BRICK RAILING 3'-8" HIGH | LF | 271.000 | 271.000 |
| 0401 0702 | 3'-8" HIGH - 2" DIA WELDED PIPE RAILING | LF | 271.000 | 271.000 |
| 0401 08 | EXTERIOR SOFFITS | SF | 1,911.000 | 1,911.000 |
| 0401 0801 | GYPSUM PLASTER EXTERIOR SOFFITS | SF | 1,911.000 | 1,911.000 |
| 0402 | EXTERIOR DOORS | EA | 16.000 | 16.000 |
| 0402 01 | GLAZED DOORS | EA | 14.000 | 14.000 |
| 0402 0104 | 6'-0" X 7'-0" ALUMINUM AND GLASS DOOR WITH TRANSOM | EA | 7.000 | 7.000 |
| 0402 02 | SOLID DOORS | EA | 2.000 | 2.000 |
| 0402 0201 | 3'0" X 7'0" HOLLOW METAL DOOR | EA | 2.000 | 2.000 |
| 0403 | EXTERIOR WINDOWS | SF | 849.000 | 849.000 |
| 0403 01 | WINDOWS | SF | 849.000 | 849.000 |
| 0403 0110 | ALUMINUM FRM SLIDING TYPE WINDOW - 3/8" BRONZE | SF | 849.000 | 849.000 |
| 05 | INTERIOR CONSTRUCTION | | | |
| | LAUNDRY, STORAGE, AND MAID'S ROOM | | | |
| 0501 | PARTITIONS | SF | 791.000 | 791.000 |
| 0501 01 | FIXED PARTITIONS | SF | 753.000 | 753.000 |
| 0501 0102 | NON-LOAD BRG PARTITION - 24" O.C. | SF | 753.000 | 753.000 |
| 0502 | INTERIOR DOORS | EA | 2.000 | 2.000 |
| 0502 01 | STANDARD INTERIOR DOORS | EA | 2.000 | 2.000 |
| 0502 0117 | 3'-0" X 7'-0" WOOD DOOR, HM FRM | EA | 2.000 | 2.000 |
| | LOUNGE AND GAME ROOM | | | |
| 0501 | PARTITIONS | SF | 396.000 | 396.000 |
| 0501 01 | FIXED PARTITIONS | SF | 472.000 | 472.000 |
| 0501 0102 | NON-LOAD BRG PARTITION - 24" O.C. | SF | 472.000 | 472.000 |
| 0502 | INTERIOR DOORS | EA | 2.000 | 2.000 |
| 0502 01 | STANDARD INTERIOR DOORS | EA | 2.000 | 2.000 |

GENERIC DORMITORY MODEL, INPUT PARAMETERS, DEFAULT RUN

| | | UM | MODEL/ESTIMATED QUANTITY | USER QUANTITY |
|---|---|---|---|---|
| 0502 0117 | 3'-0" X 7'-0" WOOD DOOR, HM FRM | EA | 2.000 | 2.000 |
| | **MECHANICAL, ELECTRICAL, & BUILDING SUPPORT** | | | |
| 0501 | PARTITIONS | SF | 547.000 | 547.000 |
| 0501 01 | FIXED PARTITIONS | SF | 395.000 | 395.000 |
| 0501 0114 | NON-LOAD BEARING 8 X 8 X 16 CONCRETE BLOCK | SF | 395.000 | 395.000 |
| | **QUARTERS - ENLISTED (544 SF/UNIT)** | | | |
| 0501 | PARTITIONS | SF | 37,533.000 | 37,533.000 |
| 0501 01 | FIXED PARTITIONS | SF | 35,746.000 | 35,746.000 |
| 0501 0102 | NON-LOAD BRG PARTITION - 24" O.C. | SF | 24,774.000 | 24,774.000 |
| 0501 0106 | MTL STUD PARTITION 4" - 1/2" GYP BD EA SIDE SOUND RATED | SF | 6,072.000 | 6,072.000 |
| 0501 0111 | NON-LOAD BRG PARTITION OF 8 X 4 X 16 CONCRETE | SF | 4,899.000 | 4,899.000 |
| 0502 | INTERIOR DOORS | EA | 205.000 | 205.000 |
| 0502 01 | STANDARD INTERIOR DOORS | EA | 205.000 | 205.000 |
| 0502 0101 | 3'-0" X 7'-0" HOLLOW METAL DOOR | EA | 51.000 | 51.000 |
| 0502 0117 | 3'-0" X 7'-0" WOOD DOOR, HM FRM | EA | 154.000 | 154.000 |
| | **FACILITY TOTAL** | | | |
| 0501 | PARTITIONS | SF | 39,267.000 | 39,267.000 |
| 0501 01 | FIXED PARTITIONS | SF | 37,366.000 | 37,366.000 |
| 0501 0102 | NON-LOAD BRG PARTITION - 24" O.C. | SF | 25,999.000 | 25,999.000 |
| 0501 0106 | MTL STUD PARTITION 4" - 1/2" GYP BD EA SIDE SOUND RATED | SF | 6,072.000 | 6,072.000 |
| 0501 0111 | NON-LOAD BRG PARTITION OF 8 X 4 X 16 CONCRETE | SF | 4,899.000 | 4,899.000 |
| 0501 0114 | NON-LOAD BEARING 8 X 8 X 16 CONCRETE BLOCK | SF | 395.000 | 395.000 |
| 0502 | INTERIOR DOORS | EA | 209.000 | 209.000 |
| 0502 01 | STANDARD INTERIOR DOORS | EA | 209.000 | 209.000 |
| 0502 0101 | 3'-0" X 7'-0" HOLLOW METAL DOOR | EA | 51.000 | 51.000 |
| 0502 0117 | 3'-0" X 7'-0" WOOD DOOR, HM FRM | EA | 158.000 | 158.000 |
| 06 | INTERIOR FINISHES | | | |
| | **LAUNDRY, STORAGE, AND MAID'S ROOM** | | | |
| 0601 | WALL FINISHES | SF | 3,250.000 | 3,250.000 |

GENERIC DORMITORY MODEL, INPUT PARAMETERS, DEFAULT RUN

| | | UM | MODEL/ESTIMATED QUANTITY | USER QUANTITY |
|---|---|---|---|---|
| 0601 05 | PAINTING TO WALL | SF | 3,250.000 | 3,250.000 |
| 0601 0506 | EPOXY PAINT TO DRYWALL | SF | 3,250.000 | 3,250.000 |
| 0602 | FLOORING & FLOOR FINISHES | SF | 1,642.000 | 1,642.000 |
| 0602 01 | TILE FLOOR FINISHES | SF | 1,642.000 | 1,642.000 |
| 0602 0101 | THIN SET NATURAL CLAY CERAMIC TILE FLOOR AND BASE | SF | 1,642.000 | 1,642.000 |
| 0603 | CEILING & CEILING FINISHES | SF | 1,642.000 | 1,642.000 |
| 0603 01 | EXPOSED CONCRETE FINISHES | SF | 821.000 | 821.000 |
| 0603 0101 | EXPOSED CONCRETE FINISH | SF | 821.000 | 821.000 |
| 0603 03 | GYPSUM WALLBOARD CEILING FINISHES | SF | 821.000 | 821.000 |
| 0603 0301 | 5/8" GYPSUM WALL BOARD CEILING, 1 LAYER, FIRE RATED | SF | 821.000 | 821.000 |
| | **LOUNGE AND GAME ROOM** | | | |
| 0601 | WALL FINISHES | SF | 2,274.000 | 2,274.000 |
| 0601 06 | WALL COVERINGS | SF | 772.000 | 772.000 |
| 0601 0602 | MEDIUM WEIGHT VINYL WALLCOVERING WITH FABRIC BACKING | SF | 772.000 | 772.000 |
| 0602 | FLOORING & FLOOR FINISHES | SF | 1,520.000 | 1,520.000 |
| 0602 04 | RESILIENT FLOORING | SF | 760.000 | 760.000 |
| 0602 0401 | VINYL TILE, 1/8 "X 12" X 12" | SF | 760.000 | 760.000 |
| 0602 05 | CARPETING | SF | 760.000 | 760.000 |
| 0602 0501 | COMMERCIAL GRADE 26 OZ. NYLON CARPET | SF | 760.000 | 760.000 |
| 0603 | CEILING & CEILING FINISHES | SF | 1,520.000 | 1,520.000 |
| 0603 01 | EXPOSED CONCRETE FINISHES | SF | 760.000 | 760.000 |
| 0603 0101 | EXPOSED CONCRETE FINISH | SF | 760.000 | 760.000 |
| 0603 03 | GYPSUM WALLBOARD CEILING FINISHES | SF | 760.000 | 760.000 |
| 0603 0301 | 5/8" GYPSUM WALL BOARD CEILING, 1 LAYER, FIRE RATED | SF | 760.000 | 760.000 |
| | **MECHANICAL, ELECTRICAL, & BUILDING SUPPORT** | | | |
| 0601 | WALL FINISHES | SF | 772.000 | 772.000 |
| 0601 05 | PAINTING TO WALL | SF | 77.000 | 77.000 |
| 0601 0502 | PAINT TO CONCRETE BLOCK USING BRUSHES, TWO COATS | SF | 77.000 | 77.000 |
| 0602 | FLOORING & FLOOR FINISHES | SF | 2,283.000 | 2,283.000 |
| 0603 | CEILING & CEILING FINISHES | SF | 2,283.000 | 2,283.000 |
| 0603 03 | GYPSUM WALLBOARD CEILING FINISHES | SF | 267.000 | 267.000 |
| 0603 0301 | 5/8" GYPSUM WALL BOARD CEILING, 1 LAYER, FIRE RATED | SF | 267.000 | 267.000 |

GENERIC DORMITORY MODEL, INPUT PARAMETERS, DEFAULT RUN

| | | UM | MODEL/ESTIMATED QUANTITY | USER QUANTITY |
|---|---|---|---|---|
| 0603 07 | SUSPENSION SYSTEMS | SF | 267.000 | 267.000 |
| 0603 0704 | SUSPENSION SYSTEM FOR GYPSUM BOARD CEILING | SF | 267.000 | 267.000 |
| | QUARTERS - ENLISTED (544 SF/UNIT) | | | |
| 0601 | WALL FINISHES | SF | 70,399.000 | 70,399.000 |
| 0601 03 | GYPSUM WALLBOARD FINISHES | SF | 20,482.000 | 20,482.000 |
| 0601 0301 | 5/8" GYPSUM BOARD ON 7/8" FURRING CHANNEL | SF | 20,482.000 | 20,482.000 |
| 0601 04 | TILE & TERRAZZO WALL FINISHES | SF | 6,786.000 | 6,786.000 |
| 0601 0401 | 4-1/4" X 4-1/4" CERAMIC TILE TO WALLS | SF | 6,786.000 | 6,786.000 |
| 0601 05 | PAINTING TO WALL | SF | 20,482.000 | 20,482.000 |
| 0601 0501 | PAINT TO GYPSUM BOARD WALLS USING ROLLER | SF | 20,482.000 | 20,482.000 |
| 0601 06 | WALL COVERINGS | SF | 2,750.000 | 2,750.000 |
| 0601 0602 | MEDIUM WEIGHT VINYL WALLCOVERING WITH FABRIC BACKING | SF | 2,750.000 | 2,750.000 |
| 0602 | FLOORING & FLOOR FINISHES | SF | 18,555.000 | 18,555.000 |
| 0602 01 | TILE FLOOR FINISHES | SF | 2,651.000 | 2,651.000 |
| 0602 0101 | THIN SET NATURAL CLAY CERAMIC TILE FLOOR AND BASE | SF | 2,651.000 | 2,651.000 |
| 0602 05 | CARPETING | SF | 11,449.000 | 11,449.000 |
| 0602 0501 | COMMERCIAL GRADE 26 OZ. NYLON CARPET | SF | 11,449.000 | 11,449.000 |
| 0603 | CEILING & CEILING FINISHES | SF | 18,555.000 | 18,555.000 |
| 0603 01 | EXPOSED CONCRETE FINISHES | SF | 11,165.000 | 11,165.000 |
| 0603 0101 | EXPOSED CONCRETE FINISH | SF | 11,165.000 | 11,165.000 |
| 0603 03 | GYPSUM WALLBOARD CEILING FINISHES | SF | 7,390.000 | 7,390.000 |
| 0603 0301 | 5/8" GYPSUM WALL BOARD CEILING, 1 LAYER, FIRE RATED | SF | 7,390.000 | 7,390.000 |
| 0603 07 | SUSPENSION SYSTEMS | SF | 7,390.000 | 7,390.000 |
| 0603 0704 | SUSPENSION SYSTEM FOR GYPSUM BOARD CEILING | SF | 7,390.000 | 7,390.000 |
| | FACILITY TOTAL | | | |
| 0601 | WALL FINISHES | SF | 76,695.000 | 76,695.000 |
| 0601 03 | GYPSUM WALLBOARD FINISHES | SF | 20,482.000 | 20,482.000 |
| 0601 0301 | 5/8" GYPSUM BOARD ON 7/8" FURRING CHANNEL | SF | 20,482.000 | 20,482.000 |
| 0601 04 | TILE & TERRAZZO WALL FINISHES | SF | 6,786.000 | 6,786.000 |
| 0601 0401 | 4-1/4" X 4-1/4" CERAMIC TILE TO WALLS | SF | 6,786.000 | 6,786.000 |
| 0601 05 | PAINTING TO WALL | SF | 23,809.000 | 23,809.000 |
| 0601 0501 | PAINT TO GYPSUM BOARD WALLS USING ROLLER | SF | 20,482.000 | 20,482.000 |
| 0601 0502 | PAINT TO CONCRETE BLOCK USING BRUSHES, TWO COATS | SF | 77.000 | 77.000 |
| 0601 0506 | EPOXY PAINT TO DRYWALL | SF | 3,250.000 | 3,250.000 |
| 0601 06 | WALL COVERINGS | SF | 3,522.000 | 3,522.000 |
| 0601 0602 | MEDIUM WEIGHT VINYL WALLCOVERING WITH FABRIC BACKING | SF | 3,522.000 | 3,522.000 |

GENERIC DORMITORY MODEL, INPUT PARAMETERS, DEFAULT RUN

| | | UM | MODEL/ESTIMATED QUANTITY | USER QUANTITY |
|---|---|---|---|---|
| 0602 | FLOORING & FLOOR FINISHES | SF | 24,600.000 | 24,600.000 |
| 0602 01 | TILE FLOOR FINISHES | SF | 4,293.000 | 4,293.000 |
| 0602 0101 | THIN SET NATURAL CLAY CERAMIC TILE FLOOR AND BASE | SF | 4,293.000 | 4,293.000 |
| 0602 04 | RESILIENT FLOORING | SF | 760.000 | 760.000 |
| 0602 0401 | VINYL TILE, 1/8 "X 12" X 12" | SF | 760.000 | 760.000 |
| 0602 05 | CARPETING | SF | 12,209.000 | 12,209.000 |
| 0602 0501 | COMMERCIAL GRADE 26 OZ. NYLON CARPET | SF | 12,209.000 | 12,209.000 |
| 0603 | CEILING & CEILING FINISHES | SF | 24,600.000 | 24,600.000 |
| 0603 01 | EXPOSED CONCRETE FINISHES | SF | 13,156.000 | 13,156.000 |
| 0603 0101 | EXPOSED CONCRETE FINISH | SF | 13,156.000 | 13,156.000 |
| 0603 03 | GYPSUM WALLBOARD CEILING FINISHES | SF | 9,238.000 | 9,238.000 |
| 0603 0301 | 5/8" GYPSUM WALL BOARD CEILING, 1 LAYER, FIRE RATED | SF | 9,238.000 | 9,238.000 |
| 0603 07 | SUSPENSION SYSTEMS | SF | 7,657.000 | 7,657.000 |
| 0603 0704 | SUSPENSION SYSTEM FOR GYPSUM BOARD CEILING | SF | 7,657.000 | 7,657.000 |
| 07 | SPECIALTIES | | | |
| | COVERED WALKWAYS AND SERVICE AREAS | | | |
| 0701 | GENERAL SPECIALTIES | SF | 600.000 | 600.000 |
| 0702 | BUILT-IN SPECIALTIES | SF | 600.000 | 600.000 |
| 0702 05 | FIRE EXTINGUISHER CABINETS | EA | 1.000 | 1.000 |
| 0702 0501 | FIRE EXTINGUISHER CABINET, 8" X 12" X 27" | EA | 1.000 | 1.000 |
| | LAUNDRY, STORAGE, AND MAID'S ROOM | | | |
| 0701 | GENERAL SPECIALTIES | SF | 1,642.000 | 1,642.000 |
| 0701 01 | COMPARTMENTS, CUBICLES, AND TOILET PARTITIONS | EA | 1.000 | 1.000 |
| 0701 0102 | TOILET PARTITION AND ACCESSORIES | EA | 1.000 | 1.000 |
| 0701 06 | SHELVING | LF | 433.000 | 433.000 |
| 0701 0601 | 10" WIDE STOCK PREFINISHED SHELVES WITH SUPPORTS | LF | 433.000 | 433.000 |
| 0702 | BUILT-IN SPECIALTIES | SF | 1,642.000 | 1,642.000 |
| 0702 01 | COUNTERS | LF | 31.000 | 31.000 |
| 0702 0101 | PLASTIC LAMINATE COUNTERTOP WITH BACKSPLASH | LF | 31.000 | 31.000 |
| | LOUNGE AND GAME ROOM | | | |
| 0701 | GENERAL SPECIALTIES | SF | 1,520.000 | 1,520.000 |

GENERIC DORMITORY MODEL, INPUT PARAMETERS, DEFAULT RUN

| | | UM | MODEL/ESTIMATED QUANTITY | USER QUANTITY |
|---|---|---|---|---|
| 0701 02 | TOILET & BATH ACCESSORIES | EA | 1.000 | 1.000 |
| 0701 0213 | ACCESSORIES FOR TYPICAL ENLISTED OR OFFICER DORM UNIT | EA | 1.000 | 1.000 |
| 0702 | BUILT-IN SPECIALTIES | SF | 1,520.000 | 1,520.000 |
| 0702 02 | CABINETS | LF | 31.000 | 31.000 |
| 0702 0203 | KTCHN CAB. - PREFINISHED HARDWD W/PLASTIC LAMINATE TOP | LF | 25.000 | 25.000 |
| 0702 0204 | BATHROOM VANITY 30" WIDE X 24" DEEP X 34" HIGH | LF | 6.000 | 6.000 |
| 0702 05 | FIRE EXTINGUISHER CABINETS | EA | 1.000 | 1.000 |
| 0702 0501 | FIRE EXTINGUISHER CABINET, 8" X 12" X 27" | EA | 1.000 | 1.000 |
| | **MECHANICAL, ELECTRICAL, & BUILDING SUPPORT** | | | |
| 0701 | GENERAL SPECIALTIES | SF | 2,283.000 | 2,283.000 |
| 0702 | BUILT-IN SPECIALTIES | SF | 2,283.000 | 2,283.000 |
| | **QUARTERS - ENLISTED (544 SF/UNIT)** | | | |
| 0701 | GENERAL SPECIALTIES | SF | 18,555.000 | 18,555.000 |
| 0701 02 | TOILET & BATH ACCESSORIES | EA | 60.000 | 60.000 |
| 0701 0213 | ACCESSORIES FOR TYPICAL ENLISTED OR OFFICER DORM UNIT | EA | 60.000 | 60.000 |
| 0701 06 | SHELVING | LF | 1,506.000 | 1,506.000 |
| 0701 0601 | 10" WIDE STOCK PREFINISHED SHELVES WITH SUPPORTS | LF | 1,506.000 | 1,506.000 |
| 0702 | BUILT-IN SPECIALTIES | SF | 18,555.000 | 18,555.000 |
| 0702 02 | CABINETS | LF | 239.000 | 239.000 |
| 0702 0202 | CUSTOM BATHRM VANITY - PREFINISHED W/PLASTIC LAM TOP | LF | 239.000 | 239.000 |
| | **FACILITY TOTAL** | | | |
| 0701 | GENERAL SPECIALTIES | SF | 24,600.000 | 24,600.000 |
| 0701 01 | COMPARTMENTS, CUBICLES, AND TOILET PARTITIONS | EA | 1.000 | 1.000 |
| 0701 0102 | TOILET PARTITION AND ACCESSORIES | EA | 1.000 | 1.000 |
| 0701 02 | TOILET & BATH ACCESSORIES | EA | 61.000 | 61.000 |
| 0701 0213 | ACCESSORIES FOR TYPICAL ENLISTED OR OFFICER DORM UNIT | EA | 61.000 | 61.000 |
| 0701 06 | SHELVING | LF | 1,939.000 | 1,939.000 |
| 0701 0601 | 10" WIDE STOCK PREFINISHED SHELVES WITH SUPPORTS | LF | 1,939.000 | 1,939.000 |
| 0702 | BUILT-IN SPECIALTIES | SF | 24,600.000 | 24,600.000 |
| 0702 01 | COUNTERS | LF | 31.000 | 31.000 |
| 0702 0101 | PLASTIC LAMINATE COUNTERTOP WITH BACKSPLASH | LF | 31.000 | 31.000 |

GENERIC DORMITORY MODEL, INPUT PARAMETERS, DEFAULT RUN

| | | UM | MODEL/ESTIMATED QUANTITY | USER QUANTITY |
|---|---|---|---|---|
| 0702 02 | CABINETS | LF | 270.000 | 270.000 |
| 0702 0202 | CUSTOM BATHRM VANITY - PREFINISHED W/PLASTIC LAM TOP | LF | 239.000 | 239.000 |
| 0702 0203 | KTCHN CAB. - PREFINISHED HARDWD W/PLASTIC LAMINATE TOP | LF | 25.000 | 25.000 |
| 0702 0204 | BATHROOM VANITY 30" WIDE X 24" DEEP X 34" HIGH | LF | 6.000 | 6.000 |
| 0702 05 | FIRE EXTINGUISHER CABINETS | EA | 2.000 | 2.000 |
| 0702 0501 | FIRE EXTINGUISHER CABINET, 8" X 12" X 27" | EA | 2.000 | 2.000 |
| 08 | PLUMBING | | | |
| 0801 | DOMESTIC WATER SUPPLY | EA | 121.000 | 121.000 |
| 0801 01 | PIPE & FITTINGS | EA | 121.000 | 121.000 |
| 0801 0101 | COPPER PIPE & FITTINGS | EA | 121.000 | 121.000 |
| 0801 02 | VALVES & HYDRANTS | EA | 57.000 | 57.000 |
| 0801 0201 | VALVES & HYDRANTS | EA | 57.000 | 57.000 |
| 0801 03 | DOMESTIC WATER SUPPLY EQUIPMENT | EA | 1.000 | 1.000 |
| 0801 0306 | DOMESTIC HOT WATER HEATERS | EA | 1.000 | 1.000 |
| 0801 04 | INSULATION | EA | 121.000 | 121.000 |
| 0801 0401 | FIBERGLASS 1-1/2" PIPE INSULATION WITH VAPOR BARRIER | EA | 121.000 | 121.000 |
| 0802 | SANITARY WASTE & VENT SYSTEM | EA | 127.000 | 127.000 |
| 0802 01 | WASTE PIPE & FITTINGS | EA | 127.000 | 127.000 |
| 0802 0101 | WASTE PIPE & FITTINGS ORDINARY FAC. | EA | 127.000 | 127.000 |
| 0802 02 | VENT PIPE & FITTINGS | EA | 127.000 | 127.000 |
| 0802 0201 | C.I. NO HUB VENT PIPE SYSTM | EA | 127.000 | 127.000 |
| 0802 03 | FLOOR DRAINS | EA | 4.000 | 4.000 |
| 0802 0304 | MEDIUM DUTY AND HEAVY DUTY CAST IRON FLOOR DRAINS, ADTL | EA | 4.000 | 4.000 |
| 0803 | RAINWATER DRAINAGE SYSTEM | SF | 26,039.000 | 26,039.000 |
| 0803 01 | PIPE & FITTINGS | LF | 704.000 | 704.000 |
| 0803 0101 | RAINWATER DRAINAGE PIPING | LF | 704.000 | 704.000 |
| 0803 02 | ROOF DRAINS | EA | 28.000 | 28.000 |
| 0803 0203 | 4" TO 3" CAST IRON ROOF DRAINS WITH ALUMINUM DOME | EA | 28.000 | 28.000 |
| | LAUNDRY, STORAGE, AND MAID'S ROOM | | | |
| 0804 | PLUMBING FIXTURES | EA | 13.000 | 13.000 |
| 0804 01 | WATER CLOSETS | EA | 1.000 | 1.000 |
| 0804 0101 | FLOOR MOUNTED - WATER CLOSET | EA | 1.000 | 1.000 |
| 0804 03 | LAVATORIES | EA | 1.000 | 1.000 |
| 0804 0308 | CAST IRON, WALLHUNG LAVATORY | EA | 1.000 | 1.000 |
| 0804 04 | SINKS | EA | 3.000 | 3.000 |
| 0804 0403 | 25" BY 22" SINGLE BOWL KITCHEN SINK OF STAINLESS STEEL | EA | 1.000 | 1.000 |
| 0804 0407 | JANITOR SINK - FLOOR TYPE | EA | 2.000 | 2.000 |

GENERIC DORMITORY MODEL, INPUT PARAMETERS, DEFAULT RUN

| | | UM | MODEL/ESTIMATED QUANTITY | USER QUANTITY |
|---|---|---|---|---|
| | **LOUNGE AND GAME ROOM** | | | |
| 0804 | PLUMBING FIXTURES | EA | 5.000 | 5.000 |
| 0804 01 | WATER CLOSETS | EA | 1.000 | 1.000 |
| 0804 0101 | FLOOR MOUNTED - WATER CLOSET | EA | 1.000 | 1.000 |
| 0804 04 | SINKS | EA | 3.000 | 3.000 |
| 0804 0401 | STAINLESS STEEL - SINGLE BOWL | EA | 3.000 | 3.000 |
| 0804 06 | DRINKING FOUNTAINS & COOLERS | EA | 1.000 | 1.000 |
| 0804 0601 | 8 GPH ELECTIC WATER COOLER - WALL MOUNTED | EA | 1.000 | 1.000 |
| | **QUARTERS - ENLISTED (544 SF/UNIT)** | | | |
| 0804 | PLUMBING FIXTURES | EA | 136.000 | 136.000 |
| 0804 01 | WATER CLOSETS | EA | 34.000 | 34.000 |
| 0804 0101 | FLOOR MOUNTED - WATER CLOSET | EA | 34.000 | 34.000 |
| 0804 03 | LAVATORIES | EA | 68.000 | 68.000 |
| 0804 0304 | 26" BY 18" WHITE OVAL LAVATORY | EA | 68.000 | 68.000 |
| 0804 05 | SHOWERS/TUBS | EA | 34.000 | 34.000 |
| 0804 0505 | PORCELAIN ENAMELED STEEL BATHTUB | EA | 34.000 | 34.000 |
| | **FACILITY TOTAL** | | | |
| 0804 | PLUMBING FIXTURES | EA | 154.000 | 154.000 |
| 0804 01 | WATER CLOSETS | EA | 36.000 | 36.000 |
| 0804 0101 | FLOOR MOUNTED - WATER CLOSET | EA | 36.000 | 36.000 |
| 0804 03 | LAVATORIES | EA | 69.000 | 69.000 |
| 0804 0304 | 26" BY 18" WHITE OVAL LAVATORY | EA | 68.000 | 68.000 |
| 0804 0308 | CAST IRON, WALLHUNG LAVATORY | EA | 1.000 | 1.000 |
| 0804 04 | SINKS | EA | 6.000 | 6.000 |
| 0804 0401 | STAINLESS STEEL - SINGLE BOWL | EA | 3.000 | 3.000 |
| 0804 0403 | 25" BY 22" SINGLE BOWL KITCHEN SINK OF STAINLESS STEEL | EA | 1.000 | 1.000 |
| 0804 0407 | JANITOR SINK - FLOOR TYPE | EA | 2.000 | 2.000 |
| 0804 05 | SHOWERS/TUBS | EA | 34.000 | 34.000 |
| 0804 0505 | PORCELAIN ENAMELED STEEL BATHTUB | EA | 34.000 | 34.000 |
| 0804 06 | DRINKING FOUNTAINS & COOLERS | EA | 1.000 | 1.000 |
| 0804 0601 | 8 GPH ELECTIC WATER COOLER - WALL MOUNTED | EA | 1.000 | 1.000 |
| 09 | H.V.A.C | | | |
| 0901 | ENERGY SUPPLY | MBH | 297.000 | 297.000 |

GENERIC DORMITORY MODEL, INPUT PARAMETERS, DEFAULT RUN

| | | UM | MODEL/ESTIMATED QUANTITY | USER QUANTITY |
|---|---|---|---|---|
| 0901 02 | GAS SUPPLY SYSTEM | MBH | 535.000 | 535.000 |
| 0901 0206 | 900 MBH GAS SUPPLY | EA | 1.000 | 1.000 |
| 0901 05 | HOT WATER SUPPLY SYSTEM | MBH | 297.000 | 297.000 |
| 0902 | HEAT GENERATING SYSTEM | MBH | 297.000 | 297.000 |
| 0902 01 | STEAM BOILERS AND PIPING | MBH | 297.000 | 297.000 |
| 0902 02 | HOT WATER BOILERS AND PIPING | MBH | 297.000 | 297.000 |
| 0902 0216 | HOT WATER BOILER, GAS FIRED 320 MBH | EA | 1.000 | 1.000 |
| 0902 03 | FURNACES | MBH | 297.000 | 297.000 |
| 0903 | COOLING GENERATING SYSTEM | TONS | 23.570 | 23.570 |
| 0903 01 | CHILLED WATER SYSTEMS | TONS | 24.000 | 24.000 |
| 0903 0103 | 30 TON AIR COOLED RECIP. CHILLER W/MECH. ROOM PIPING | EA | 1.000 | 1.000 |
| 0903 02 | DIRECT EXPANSION SYSTEMS | TONS | 24.000 | 24.000 |
| 0904 | DISTRIBUTION SYSTEMS | MBH | 580.000 | 580.000 |
| 0904 01 | AIR DISTRIBUTION, COOLING AND HEATING | MCFM | 8.364 | 8.364 |
| 0904 0101 | .3 MCFM FAN COIL UNIT ASSEMBLY | MCFM | 7.825 | 7.825 |
| 0904 0116 | 1.6MCFM AHU WITH HEAT COIL & OUTSIDE AIR INTAKE | MCFM | .539 | .539 |
| 0904 07 | CHILLED WATER DISTRIBUTION SYSTEM | TONS | 24.000 | 24.000 |
| 0904 0704 | CHILLED WATER DISTRIBUTION FOR BOQ (40 TONS 83 UNITS) | TON | 24.000 | 24.000 |
| 0905 | TERMINAL & PACKAGE UNITS | MBH | 580.000 | 580.000 |
| 0906 | CONTROLS & INSTRUMENTATION | MBH | 580.000 | 580.000 |
| 0907 | SYSTEMS TESTING & BALANCING | MBH | 580.000 | 580.000 |
| 0907 01 | WATER SIDE TESTING & BALANCING, HEATING AND COOLING | EA | 30.000 | 30.000 |
| 0907 0102 | WATER TEST & BALANCE BOILER | EA | 1.000 | 1.000 |
| 0907 0105 | WATER, TEST & BALANCE CHILLER | EA | 1.000 | 1.000 |
| 0907 0107 | WATER, TEST & BALANCE FAN COIL, FIN TUBE | EA | 28.000 | 28.000 |
| 0907 0109 | WATER, TEST & BALANCE PUMP | EA | 1.000 | 1.000 |
| 0907 02 | AIR SIDE TESTING & BALANCING, HEATNG, COOLNG & EXH SYST | EA | 85.000 | 85.000 |
| 0907 0202 | TEST & BALANCE H & V UNIT/IN LINE FAN | EA | 28.000 | 28.000 |
| 0907 0204 | TEST & BALANCE ROOF EXHAUST FAN | EA | 1.000 | 1.000 |
| 0907 0212 | TEST & BALANCE REGISTER AVERAGE CEILING HEIGHT | EA | 56.000 | 56.000 |
| 0908 | VENTILATING/EXHAUST SYSTEMS | MCFM | 1.279 | 1.279 |
| 0908 01 | EXHAUST DISTRIBUTION SYSTEMS | MCFM | 1.279 | 1.279 |
| 0908 0130 | .2 MCFM EXHAUST SYSTEM FOR BOQ | MCFM | .119 | .119 |
| 0908 0194 | 1.95 MCFM EXHAUST SYSTEM FOR BOQ | MCFM | 1.160 | 1.160 |
| 10 | SPECIAL MECHANICAL SYSTEMS | | | |
| 1001 | FIRE PROTECTION | SF | 24,600.000 | 24,600.000 |

GENERIC DORMITORY MODEL, INPUT PARAMETERS, DEFAULT RUN

| | | UM | MODEL/ESTIMATED QUANTITY | USER QUANTITY |
|---|---|---|---|---|
| 1001 01 | WATER SUPPLY (FIRE PROTECTION) | EA | 253.000 | 253.000 |
| 1001 0105 | FIRE PROTECTION WATER SUPPLY | EA | 253.000 | 253.000 |
| 1001 02 | SPRINKLERS | EA | 253.000 | 253.000 |
| 1001 0202 | CONCEALED SPRINKLER HEADS, PIPES & FITTINGS -ORD. HAZ. | EA | 253.000 | 253.000 |
| | COVERED WALKWAYS AND SERVICE AREAS | | | |
| 1002 | OTHER SPECIAL MECHANICAL SYSTEMS | SF | 600.000 | 600.000 |
| | LAUNDRY, STORAGE, AND MAID'S ROOM | | | |
| 1002 | OTHER SPECIAL MECHANICAL SYSTEMS | SF | 1,642.000 | 1,642.000 |
| | LOUNGE AND GAME ROOM | | | |
| 1002 | OTHER SPECIAL MECHANICAL SYSTEMS | SF | 1,520.000 | 1,520.000 |
| | MECHANICAL, ELECTRICAL, & BUILDING SUPPORT | | | |
| 1002 | OTHER SPECIAL MECHANICAL SYSTEMS | SF | 2,283.000 | 2,283.000 |
| | QUARTERS - ENLISTED (544 SF/UNIT) | | | |
| 1002 | OTHER SPECIAL MECHANICAL SYSTEMS | SF | 18,555.000 | 18,555.000 |
| | FACILITY TOTAL | | | |
| 1002 | OTHER SPECIAL MECHANICAL SYSTEMS | SF | 24,600.000 | 24,600.000 |
| 11 | ELECTRICAL | | | |
| 1101 | SERVICE AND DISTRIBUTION | AMPS | 522.000 | 522.000 |
| 1101 01 | MAIN TRANSFORMER | AMPS | 522.000 | 522.000 |
| 1101 0103 | UNGRD 600 AMP MAIN TRANSFORMER | EA | 1.000 | 1.000 |
| 1101 02 | SECONDARY | AMPS | 522.000 | 522.000 |
| 1101 0206 | UNGRD 600 AMP SECONDARY | EA | 1.000 | 1.000 |
| 1101 03 | MAIN SWITCHBOARD | AMPS | 522.000 | 522.000 |
| 1101 0306 | UNGRD 600 AMP MAIN SWITCHBOARD | EA | 1.000 | 1.000 |

GENERIC DORMITORY MODEL, INPUT PARAMETERS, DEFAULT RUN

| | | UM | MODEL/ESTIMATED QUANTITY | USER QUANTITY |
|---|---|---|---|---|
| 1101 05 | PANELS | AMPS | 522.000 | 522.000 |
| 1101 0501 | PANELBD 208V 100A 24 CIR MLO W/BKR | EA | 3.000 | 3.000 |
| 1101 0506 | PANELBD 208V 225A 36 CIR MLO W/BKR | EA | 2.000 | 2.000 |
| 1101 0536 | PANELBD 480V 225A 36 CIR MLO W/BKR | EA | 1.000 | 1.000 |
| 1101 0537 | PANELBD 480V 225A 42 CIR MLO W/BKR | EA | 1.000 | 1.000 |
| | COVERED WALKWAYS AND SERVICE AREAS | | | |
| 1102 | LIGHTING & POWER | SF | 600.000 | 600.000 |
| 1102 01 | BRANCH WIRING | EA | 7.000 | 7.000 |
| 1102 0102 | 120 VOLT, 20 AMP DUPLEX RECEPTACLE - MASONRY PARTITION | EA | 2.000 | 2.000 |
| 1102 0103 | DUPLEX RECEPTACLE LONG RUN | EA | 3.000 | 3.000 |
| 1102 0122 | 230 VOLT, 30 AMP RECEPTACLE - MASONRY PARTITION | EA | 2.000 | 2.000 |
| 1102 0136 | EQUIPMENT CONNECTIONS FOR UP TO 5 HP | EA | 1.000 | 1.000 |
| 1102 0156 | 120V 20A SINGLE POLE SWITCH | EA | 1.000 | 1.000 |
| 1102 02 | LIGHTING EQUIPMENT | EA | 4.000 | 4.000 |
| 1102 0202 | 2' X 4' LAY-IN FLUORESCENT FIXTURE | EA | 1.000 | 1.000 |
| 1102 0209 | SURFACE MOUNT 2' X 4' FLUORESCENT FIXTURE | EA | 3.000 | 3.000 |
| 1102 0214 | SURFACE MOUNTED 1' X 4' FLUORESCENT FIXTURE | EA | 1.000 | 1.000 |
| 1102 0276 | PORCELAIN LAMP HOLDER | EA | 1.000 | 1.000 |
| | LAUNDRY, STORAGE, AND MAID'S ROOM | | | |
| 1102 | LIGHTING & POWER | SF | 1,642.000 | 1,642.000 |
| 1102 01 | BRANCH WIRING | EA | 14.000 | 14.000 |
| 1102 0103 | DUPLEX RECEPTACLE LONG RUN | EA | 12.000 | 12.000 |
| 1102 0136 | EQUIPMENT CONNECTIONS FOR UP TO 5 HP | EA | 2.000 | 2.000 |
| 1102 0156 | 120V 20A SINGLE POLE SWITCH | EA | 1.000 | 1.000 |
| 1102 02 | LIGHTING EQUIPMENT | EA | 18.000 | 18.000 |
| 1102 0204 | 277 VOLT 2' X 4' FLUORESCENT FIXTURE | EA | 3.000 | 3.000 |
| 1102 0214 | SURFACE MOUNTED 1' X 4' FLUORESCENT FIXTURE | EA | 3.000 | 3.000 |
| 1102 0220 | CEILING RECESSED INCANDESCENT 100 WATT FIXTURE | EA | 7.000 | 7.000 |
| 1102 0272 | EXIT LIGHT WITH BATTERY BACKUP | EA | 5.000 | 5.000 |
| | LOUNGE AND GAME ROOM | | | |
| 1102 | LIGHTING & POWER | SF | 1,520.000 | 1,520.000 |
| 1102 01 | BRANCH WIRING | EA | 13.000 | 13.000 |
| 1102 0103 | DUPLEX RECEPTACLE LONG RUN | EA | 1.000 | 1.000 |
| 1102 0108 | DUPLEX GFI RECEPTACLE LONG RUN | EA | 11.000 | 11.000 |
| 1102 0138 | 480 VOLT EQUIPMENT CONNECTIONS FOR MOTORS - 15 TO 25 HP | EA | 1.000 | 1.000 |

GENERIC DORMITORY MODEL, INPUT PARAMETERS, DEFAULT RUN

| | | UM | MODEL/ESTIMATED QUANTITY | USER QUANTITY |
|---|---|---|---|---|
| 1102 0156 | 120V 20A SINGLE POLE SWITCH | EA | 1.000 | 1.000 |
| 1102 02 | LIGHTING EQUIPMENT | EA | 13.000 | 13.000 |
| 1102 0230 | 100W MERCURY VAPOR WALLMOUNT | EA | 9.000 | 9.000 |
| 1102 0235 | 150 WATT HPS RECESSED FIXTURE | EA | 1.000 | 1.000 |
| 1102 0272 | EXIT LIGHT WITH BATTERY BACKUP | EA | 2.000 | 2.000 |
| 1102 0274 | 6V EMERGENCY BATTERY PACK | EA | 2.000 | 2.000 |
| | MECHANICAL, ELECTRICAL, & BUILDING SUPPORT | | | |
| 1102 | LIGHTING & POWER | SF | 2,283.000 | 2,283.000 |
| 1102 01 | BRANCH WIRING | EA | 13.000 | 13.000 |
| 1102 0102 | 120 VOLT, 20 AMP DUPLEX RECEPTACLE - MASONRY PARTITION | EA | 10.000 | 10.000 |
| 1102 0156 | 120V 20A SINGLE POLE SWITCH | EA | 3.000 | 3.000 |
| 1102 02 | LIGHTING EQUIPMENT | EA | 6.000 | 6.000 |
| 1102 0276 | PORCELAIN LAMP HOLDER | EA | 6.000 | 6.000 |
| | QUARTERS - ENLISTED (544 SF/UNIT) | | | |
| 1102 | LIGHTING & POWER | SF | 18,555.000 | 18,555.000 |
| 1102 01 | BRANCH WIRING | EA | 663.000 | 663.000 |
| 1102 0102 | 120 VOLT, 20 AMP DUPLEX RECEPTACLE - MASONRY PARTITION | EA | 422.000 | 422.000 |
| 1102 0103 | DUPLEX RECEPTACLE LONG RUN | EA | 60.000 | 60.000 |
| 1102 0107 | 120 VOLT, 15 AMP DUPLEX GROUND FAULT RECEPTACLE | EA | 60.000 | 60.000 |
| 1102 0122 | 230 VOLT, 30 AMP RECEPTACLE - MASONRY PARTITION | EA | 60.000 | 60.000 |
| 1102 0156 | 120V 20A SINGLE POLE SWITCH | EA | 60.000 | 60.000 |
| 1102 02 | LIGHTING EQUIPMENT | EA | 482.000 | 482.000 |
| 1102 0201 | FOUR FOOT STRIP FLOURESCENT FIXTURE | EA | 60.000 | 60.000 |
| 1102 0211 | 4' 2 LAMP WALL MOUNT FLORESCENT | EA | 121.000 | 121.000 |
| 1102 0214 | SURFACE MOUNTED 1' X 4' FLUORESCENT FIXTURE | EA | 121.000 | 121.000 |
| 1102 0249 | 150W PENDANT MOUNT INDUSTRIAL FIXTURE | EA | 121.000 | 121.000 |
| 1102 0276 | PORCELAIN LAMP HOLDER | EA | 60.000 | 60.000 |
| | FACILITY TOTAL | | | |
| 1102 | LIGHTING & POWER | SF | 24,600.000 | 24,600.000 |
| 1102 01 | BRANCH WIRING | EA | 710.000 | 710.000 |
| 1102 0102 | 120 VOLT, 20 AMP DUPLEX RECEPTACLE - MASONRY PARTITION | EA | 434.000 | 434.000 |
| 1102 0103 | DUPLEX RECEPTACLE LONG RUN | EA | 76.000 | 76.000 |
| 1102 0107 | 120 VOLT, 15 AMP DUPLEX GROUND FAULT RECEPTACLE | EA | 60.000 | 60.000 |
| 1102 0108 | DUPLEX GFI RECEPTACLE LONG RUN | EA | 11.000 | 11.000 |
| 1102 0122 | 230 VOLT, 30 AMP RECEPTACLE - MASONRY PARTITION | EA | 62.000 | 62.000 |

GENERIC DORMITORY MODEL, INPUT PARAMETERS, DEFAULT RUN

| | | UM | MODEL/ESTIMATED QUANTITY | USER QUANTITY |
|---|---|---|---|---|
| 1102 0136 | EQUIPMENT CONNECTIONS FOR UP TO 5 HP | EA | 3.000 | 3.000 |
| 1102 0138 | 480 VOLT EQUIPMENT CONNECTIONS FOR MOTORS - 15 TO 25 HP | EA | 1.000 | 1.000 |
| 1102 0156 | 120V 20A SINGLE POLE SWITCH | EA | 66.000 | 66.000 |
| 1102 02 | LIGHTING EQUIPMENT | EA | 523.000 | 523.000 |
| 1102 0201 | FOUR FOOT STRIP FLOURESCENT FIXTURE | EA | 60.000 | 60.000 |
| 1102 0202 | 2' X 4' LAY-IN FLUORESCENT FIXTURE | EA | 1.000 | 1.000 |
| 1102 0204 | 277 VOLT 2' X 4' FLUORESCENT FIXTURE | EA | 3.000 | 3.000 |
| 1102 0209 | SURFACE MOUNT 2' X 4' FLUORESCENT FIXTURE | EA | 3.000 | 3.000 |
| 1102 0211 | 4' 2 LAMP WALL MOUNT FLORESCENT | EA | 121.000 | 121.000 |
| 1102 0214 | SURFACE MOUNTED 1' X 4' FLUORESCENT FIXTURE | EA | 125.000 | 125.000 |
| 1102 0220 | CEILING RECESSED INCANDESCENT 100 WATT FIXTURE | EA | 7.000 | 7.000 |
| 1102 0230 | 100W MERCURY VAPOR WALLMOUNT | EA | 9.000 | 9.000 |
| 1102 0235 | 150 WATT HPS RECESSED FIXTURE | EA | 1.000 | 1.000 |
| 1102 0249 | 150W PENDANT MOUNT INDUSTRIAL FIXTURE | EA | 121.000 | 121.000 |
| 1102 0272 | EXIT LIGHT WITH BATTERY BACKUP | EA | 7.000 | 7.000 |
| 1102 0274 | 6V EMERGENCY BATTERY PACK | EA | 2.000 | 2.000 |
| 1102 0276 | PORCELAIN LAMP HOLDER | EA | 67.000 | 67.000 |
| 12 | SPECIAL ELECTRICAL SYSTEMS | | | |
| 1201 | COMMUNICATION & ALARM SYSTEMS | SF | 24,600.000 | 24,600.000 |
| 1201 01 | FIRE ALARM SYSTEMS | OUTLT | 79.000 | 79.000 |
| 1201 0102 | FIRE ALARM SYSTEM - RATE OF RISE HEAT DETECTORS | OUT | 78.000 | 78.000 |
| 1201 0104 | FIRE ALARM DUCT SMOKE DETECTOR | EA | 1.000 | 1.000 |
| 1201 0118 | 12-ZONE FACP WITH ANNUM AND TRANSMITTER | EA | 1.000 | 1.000 |
| 1201 03 | TELEPHONE SYSTEMS | OUTLT | 27.000 | 27.000 |
| 1201 0301 | TELEPHONE SYSTEM, 2 PAIR | EA | 27.000 | 27.000 |
| 1201 07 | TELEVISION SYSTEMS | OUTLT | 28.000 | 28.000 |
| 1201 0701 | TELEVISION OUTLET COMPLETE WITH WIRE AND CONDUIT | EA | 27.000 | 27.000 |
| 1201 0702 | MASTER TELEVISION ANTENNA WITH POLE | EA | 1.000 | 1.000 |
| 1202 | OTHER SPECIAL ELECTRICAL SYSTEMS | SF | 24,600.000 | 24,600.000 |
| 13 | EQUIPMENT | | | |

COVERED WALKWAYS AND SERVICE AREAS

| | | | | |
|---|---|---|---|---|
| 1301 | COMMON FIXED & MOVEABLE EQUIPMENT | SF | 600.000 | 600.000 |
| 1302 | SPECIALIZED FIXED & MOVEABLE EQUIPMENT | SF | 600.000 | 600.000 |
| 1303 | FURNISHINGS | SF | 600.000 | 600.000 |
| 1304 | SPECIAL CONSTRUCTION | SF | 600.000 | 600.000 |

GENERIC DORMITORY MODEL, INPUT PARAMETERS, DEFAULT RUN

| | | UM | MODEL/ESTIMATED QUANTITY | USER QUANTITY |
|---|---|---|---|---|
| | LAUNDRY, STORAGE, AND MAID'S ROOM | | | |
| 1301 | COMMON FIXED & MOVEABLE EQUIPMENT | SF | 1,642.000 | 1,642.000 |
| 1302 | SPECIALIZED FIXED & MOVEABLE EQUIPMENT | SF | 1,642.000 | 1,642.000 |
| 1303 | FURNISHINGS | SF | 1,642.000 | 1,642.000 |
| 1304 | SPECIAL CONSTRUCTION | SF | 1,642.000 | 1,642.000 |
| | LOUNGE AND GAME ROOM | | | |
| 1301 | COMMON FIXED & MOVEABLE EQUIPMENT | SF | 1,520.000 | 1,520.000 |
| 1302 | SPECIALIZED FIXED & MOVEABLE EQUIPMENT | SF | 1,520.000 | 1,520.000 |
| 1303 | FURNISHINGS | SF | 1,520.000 | 1,520.000 |
| 1304 | SPECIAL CONSTRUCTION | SF | 1,520.000 | 1,520.000 |
| | MECHANICAL, ELECTRICAL, & BUILDING SUPPORT | | | |
| 1301 | COMMON FIXED & MOVEABLE EQUIPMENT | SF | 2,283.000 | 2,283.000 |
| 1302 | SPECIALIZED FIXED & MOVEABLE EQUIPMENT | SF | 2,283.000 | 2,283.000 |
| 1303 | FURNISHINGS | SF | 2,283.000 | 2,283.000 |
| 1304 | SPECIAL CONSTRUCTION | SF | 2,283.000 | 2,283.000 |
| | QUARTERS - ENLISTED (544 SF/UNIT) | | | |
| 1301 | COMMON FIXED & MOVEABLE EQUIPMENT | SF | 18,555.000 | 18,555.000 |
| 1302 | SPECIALIZED FIXED & MOVEABLE EQUIPMENT | SF | 18,555.000 | 18,555.000 |
| 1303 | FURNISHINGS | SF | 18,555.000 | 18,555.000 |
| 1303 02 | WINDOW TREATMENT | SF | 964.000 | 964.000 |
| 1303 0201 | HORIZONTAL BLINDS | SF | 964.000 | 964.000 |

GENERIC DORMITORY MODEL, INPUT PARAMETERS, DEFAULT RUN

| | | UM | MODEL/ESTIMATED QUANTITY | USER QUANTITY |
|---|---|---|---|---|
| 1304 | SPECIAL CONSTRUCTION | SF | 18,555.000 | 18,555.000 |
| | FACILITY TOTAL | | | |
| 1301 | COMMON FIXED & MOVEABLE EQUIPMENT | SF | 24,600.000 | 24,600.000 |
| 1302 | SPECIALIZED FIXED & MOVEABLE EQUIPMENT | SF | 24,600.000 | 24,600.000 |
| 1303 | FURNISHINGS | SF | 24,600.000 | 24,600.000 |
| 1303 02 | WINDOW TREATMENT | SF | 964.000 | 964.000 |
| 1303 0201 | HORIZONTAL BLINDS | SF | 964.000 | 964.000 |
| 1304 | SPECIAL CONSTRUCTION | SF | 24,600.000 | 24,600.000 |

* END OF REPORT *

GENERIC DORMITORY MODEL, COMPUTER OUTPUT-SYSTEMS LEVEL, DEFAULT RUN

| SYSTEM DESCRIPTION | $ MAT (000) | $ LAB (000) | $ EQ (000) | $ TOTAL (000) | % TOT | $/FAC QTY | TOT MH | TOT EH |
|---|---|---|---|---|---|---|---|---|
| 01 SUBSTRUCTURE | 67.8 | 37.4 | 4.7 | 109.9 | 7.4% | 4.47 | 2,932 | 919 |
| 02 SUPERSTRUCTURE | 64.5 | 46.5 | 5.1 | 116.1 | 7.8% | 4.72 | 3,437 | 940 |
| 03 ROOFING | 38.3 | 28.5 | 0.8 | 67.6 | 4.5% | 2.74 | 2,047 | 439 |
| 04 EXTERIOR CLOSURE | 82.8 | 61.1 | 1.1 | 145.0 | 9.8% | 5.89 | 4,476 | 815 |
| 05 INTERIOR CONSTRUCTION | 110.5 | 80.2 | 1.8 | 192.5 | 13.0% | 7.82 | 5,084 | 1,168 |
| 06 INTERIOR FINISHES | 76.9 | 78.1 | 1.4 | 156.4 | 10.5% | 6.36 | 5,486 | 965 |
| 07 SPECIALTIES | 28.5 | 15.2 | 0.4 | 44.1 | 3.0% | 1.79 | 1,007 | 256 |
| 08 PLUMBING | 99.3 | 72.1 | 1.9 | 173.3 | 11.7% | 7.04 | 4,371 | 1,350 |
| 09 H.V.A.C | 70.2 | 48.1 | 1.2 | 119.5 | 8.0% | 4.86 | 2,789 | 878 |
| 10 SPECIAL MECHANICAL SYSTEMS | 27.9 | 0.6 | 0.0 | 28.5 | 1.9% | 1.16 | 35 | 10 |
| 11 ELECTRICAL | 116.1 | 167.3 | 1.0 | 284.4 | 19.1% | 11.56 | 7,771 | 737 |
| 12 SPECIAL ELECTRICAL SYSTEMS | 20.8 | 24.7 | 0.1 | 45.6 | 3.1% | 1.85 | 1,144 | 107 |
| 13 EQUIPMENT | 2.9 | 0.3 | 0.0 | 3.2 | 0.2% | 0.13 | 19 | 5 |
| FACILITY TOTAL | 806.4 | 660.1 | 19.6 | 1,486.1 | 100.0% | 60.41 | 40,599 | 8,590 |
| PERCENT OF FACILITY TOTAL | 54.3% | 44.4% | 1.3% | | | | | |

GENERIC DORMITORY MODEL, COMPUTER OUTPUT-ASSEMBLY LEVEL, DEFAULT RUN

| SYSTEM/SUBSYSTEM<br>ASSEMBLY DESCRIPTION | $ MAT (000) | $ LAB (000) | $ EQ (000) | $ TOTAL (000) | % TOT | $/FAC QTY | TOT MH | TOT EH |
|---|---|---|---|---|---|---|---|---|
| SYSTEM 01 SUBSTRUCTURE | | | | | | | | |
| SUBSYSTEM 01 STANDARD FOUNDATION | | | | | | | | |
| ASSEMBLY 0102/00 1' X 2' STRIP FOOTING, 3,000 PSI | 3.8 | 2.3 | 0.2 | 6.3 | 10.5% | 0.25 | 180 | 45 |
| ASSEMBLY 0103/00 1'0" X 3'0" STRIP FOOTING 3000 PSI | 16.2 | 8.2 | 0.6 | 25.0 | 41.7% | 1.02 | 659 | 169 |
| ASSEMBLY 0131/00 15" THICK CONRETE FOUNDATION WALL 4000 PSI, 16" DEEP | 13.9 | 9.7 | 1.0 | 24.6 | 41.0% | 1.00 | 781 | 225 |
| ASSEMBLY 0201/00 SPREAD FOOTING | 0.9 | 0.3 | 0.0 | 1.2 | 2.0% | 0.05 | 23 | 8 |
| ASSEMBLY 0241/00 SPREAD FTG, REINFORCING STEEL | 0.4 | 0.2 | 0.0 | 0.6 | 1.0% | 0.02 | 13 | 2 |
| ASSEMBLY 0277/00 SPREAD FTG COL BOLTS | 0.3 | 1.9 | 0.0 | 2.2 | 3.7% | 0.09 | 123 | 32 |
| SUBSYSTEM 01 TOTAL | 35.6 | 22.6 | 1.8 | 60.0 | 54.6% | 2.44 | 1,778 | 482 |
| PERCENT OF SUBSYSTEM TOTAL | 59.3% | 37.7% | 3.0% | | | | | |
| SYSTEM 01 SUBSTRUCTURE | | | | | | | | |
| SUBSYSTEM 03 SLAB ON GRADE | | | | | | | | |
| ASSEMBLY 0102/00 5" STANDARD SLAB ON GRADE | 32.2 | 14.8 | 3.0 | 50.0 | 100.0% | 2.03 | 1,154 | 438 |
| SUBSYSTEM 03 TOTAL | 32.2 | 14.8 | 3.0 | 50.0 | 45.5% | 2.03 | 1,154 | 438 |
| PERCENT OF SUBSYSTEM TOTAL | 64.4% | 29.6% | 6.0% | | | | | |
| SYSTEM 01 TOTAL | 67.8 | 37.4 | 4.7 | 109.9 | 7.4% | 4.47 | 2,932 | 919 |
| PERCENT OF SYSTEM TOTAL | 61.7% | 34.0% | 4.3% | | | | | |
| SYSTEM 02 SUPERSTRUCTURE | | | | | | | | |
| SUBSYSTEM 02 ROOF CONSTRUCTION | | | | | | | | |
| ASSEMBLY 0130/00 WOOD TRUSS ROOF FRAMING W/ 3/4" PLYWD ROOF DECK | 45.3 | 24.0 | 4.7 | 74.0 | 63.7% | 3.01 | 1,609 | 656 |
| ASSEMBLY 0203/00 8" INTERIOR LOAD BRG CONCRETE MASONRY UNIT WALL | 19.2 | 22.5 | 0.4 | 42.1 | 36.3% | 1.71 | 1,828 | 283 |
| SUBSYSTEM 02 TOTAL | 64.5 | 46.5 | 5.1 | 116.1 | 100.0% | 4.72 | 3,437 | 940 |
| PERCENT OF SUBSYSTEM TOTAL | 55.6% | 40.1% | 4.3% | | | | | |
| SYSTEM 02 TOTAL | 64.5 | 46.5 | 5.1 | 116.1 | 7.8% | 4.72 | 3,437 | 940 |
| PERCENT OF SYSTEM TOTAL | 55.6% | 40.1% | 4.3% | | | | | |

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GENERIC DORMITORY MODEL, COMPUTER OUTPUT-ASSEMBLY LEVEL, DEFAULT RUN

| SYSTEM/SUBSYSTEM ASSEMBLY DESCRIPTION | $ MAT (000) | $ LAB (000) | $ EQ (000) | $ TOTAL (000) | % TOT | $/FAC QTY | TOT MH | TOT EH |
|---|---|---|---|---|---|---|---|---|
| SYSTEM 03 ROOFING | | | | | | | | |
| SUBSYSTEM 01 ROOFING | | | | | | | | |
| ASSEMBLY 0105/00 STRIP SHINGLES, 4" SLOPE, MULTI-LAYERED, CLASS A | 6.5 | 5.7 | 0.0 | 12.2 | 18.0% | 0.50 | 474 | 76 |
| ASSEMBLY 0307/00 1" RIGID INSULATION (2 LAYERS) | 13.0 | 8.1 | 0.3 | 21.4 | 31.7% | 0.87 | 651 | 104 |
| ASSEMBLY 0405/00 MISC. ROOFING ITEMS - 12" GRAVEL STOP | 18.7 | 14.7 | 0.5 | 33.9 | 50.1% | 1.38 | 922 | 260 |
| SUBSYSTEM 01 TOTAL | 38.3 | 28.5 | 0.8 | 67.6 | 100.0% | 2.74 | 2,047 | 439 |
| PERCENT OF SUBSYSTEM TOTAL | 56.7% | 42.2% | 1.1% | | | | | |
| SYSTEM 03 TOTAL | 38.3 | 28.5 | 0.8 | 67.6 | 4.5% | 2.74 | 2,047 | 439 |
| PERCENT OF SYSTEM TOTAL | 56.7% | 42.2% | 1.1% | | | | | |
| SYSTEM 04 EXTERIOR CLOSURE | | | | | | | | |
| SUBSYSTEM 01 EXTERIOR WALLS | | | | | | | | |
| ASSEMBLY 0110/00 8" LOAD BEARING CONCRETE BLOCK EXTERIOR CLOSURE WALL | 32.1 | 29.5 | 0.4 | 62.0 | 53.7% | 2.52 | 2,354 | 396 |
| ASSEMBLY 0201/00 POLYSTYRENE RIGID WALL INSULATION, 1" THICK | 3.1 | 2.1 | 0.0 | 5.2 | 4.5% | 0.21 | 129 | 32 |
| ASSEMBLY 0301/00 3 5/8" MTL. STUD NON-LOAD BEARING INTERIOR SKIN | 6.2 | 10.3 | 0.3 | 16.8 | 14.5% | 0.68 | 545 | 127 |
| ASSEMBLY 0304/00 REINFORCED 8" CONCRETE MASONRY UNIT BACK-UP WALL | 3.3 | 4.2 | 0.1 | 7.6 | 6.6% | 0.30 | 335 | 53 |
| ASSEMBLY 0501/00 FIXED BLADE EXTERIOR LOUVER WITH BAKED ENAMEL FINISH | 1.4 | 1.6 | 0.0 | 3.0 | 2.6% | 0.13 | 86 | 24 |
| ASSEMBLY 0701/00 9" SOLID BRICK RAILING 3'-8" HIGH | 2.8 | 4.5 | 0.1 | 7.4 | 6.4% | 0.30 | 360 | 57 |
| ASSEMBLY 0702/00 3'-8" HIGH - 2" DIA WELDED PIPE RAILING | 8.3 | 0.6 | 0.0 | 8.9 | 7.7% | 0.37 | 41 | 16 |
| ASSEMBLY 0801/00 GYPSUM PLASTER EXTERIOR SOFFITS | 2.3 | 2.1 | 0.1 | 4.5 | 3.9% | 0.18 | 158 | 44 |
| SUBSYSTEM 01 TOTAL | 59.5 | 55.0 | 1.0 | 115.5 | 79.7% | 4.69 | 4,009 | 749 |
| PERCENT OF SUBSYSTEM TOTAL | 51.5% | 47.6% | 0.9% | | | | | |
| SYSTEM 04 EXTERIOR CLOSURE | | | | | | | | |
| SUBSYSTEM 02 EXTERIOR DOORS | | | | | | | | |
| ASSEMBLY 0104/00 6'-0" X 7'-0" ALUMINUM AND GLASS DOOR WITH TRANSOM | 11.5 | 2.4 | 0.0 | 13.9 | 90.8% | 0.57 | 131 | 30 |

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GENERIC DORMITORY MODEL, COMPUTER OUTPUT-ASSEMBLY LEVEL, DEFAULT RUN

| SYSTEM/SUBSYSTEM<br>ASSEMBLY DESCRIPTION | $ MAT (000) | $ LAB (000) | $ EQ (000) | $ TOTAL (000) | % TOT | $/FAC QTY | TOT MH | TOT EH |
|---|---|---|---|---|---|---|---|---|
| ASSEMBLY 0201/00 3'0" X 7'0" HOLLOW METAL DOOR | 0.9 | 0.4 | 0.0 | 1.3 | 8.5% | 0.05 | 25 | 6 |
| SUBSYSTEM 02 TOTAL | 12.4 | 2.8 | 0.1 | 15.3 | 10.6% | 0.62 | 156 | 37 |
| PERCENT OF SUBSYSTEM TOTAL | 81.0% | 18.3% | 0.7% | | | | | |
| SYSTEM 04 EXTERIOR CLOSURE | | | | | | | | |
| SUBSYSTEM 03 EXTERIOR WINDOWS | | | | | | | | |
| ASSEMBLY 0110/00 ALUMINUM FRM SLIDING TYPE WINDOW - 3/8" BRONZE | 10.8 | 3.4 | 0.0 | 14.2 | 100.0% | 0.58 | 311 | 30 |
| SUBSYSTEM 03 TOTAL | 10.8 | 3.4 | 0.0 | 14.2 | 9.8% | 0.58 | 311 | 30 |
| PERCENT OF SUBSYSTEM TOTAL | 76.1% | 23.9% | 0.0% | | | | | |
| SYSTEM 04 TOTAL | 82.8 | 61.1 | 1.1 | 145.0 | 9.8% | 5.89 | 4,476 | 815 |
| PERCENT OF SYSTEM TOTAL | 57.1% | 42.1% | 0.8% | | | | | |
| SYSTEM 05 INTERIOR CONSTRUCTION | | | | | | | | |
| SUBSYSTEM 01 PARTITIONS | | | | | | | | |
| ASSEMBLY 0102/00 NON-LOAD BRG PARTITION - 24" O.C. | 22.9 | 31.5 | 0.8 | 55.2 | 60.9% | 2.24 | 1,828 | 413 |
| ASSEMBLY 0106/00 MTL STUD PARTITION 4" - 1/2" GYP BD EA SIDE SOUND RATED | 8.3 | 14.0 | 0.3 | 22.6 | 24.9% | 0.92 | 855 | 202 |
| ASSEMBLY 0111/00 NON-LOAD BRG PARTITION OF 8 X 4 X 16 CONCRETE | 3.8 | 7.3 | 0.1 | 11.2 | 12.4% | 0.46 | 587 | 92 |
| ASSEMBLY 0114/00 NON-LOAD BEARING 8 X 8 X 16 CONCRETE BLOCK | 0.7 | 0.8 | 0.0 | 1.5 | 1.7% | 0.06 | 61 | 10 |
| SUBSYSTEM 01 TOTAL | 35.8 | 53.6 | 1.2 | 90.6 | 47.1% | 3.68 | 3,330 | 717 |
| PERCENT OF SUBSYSTEM TOTAL | 39.5% | 59.2% | 1.3% | | | | | |
| SYSTEM 05 INTERIOR CONSTRUCTION | | | | | | | | |
| SUBSYSTEM 02 INTERIOR DOORS | | | | | | | | |
| ASSEMBLY 0101/00 3'-0" X 7'-0" HOLLOW METAL DOOR | 19.7 | 8.9 | 0.2 | 28.8 | 28.3% | 1.17 | 633 | 155 |
| ASSEMBLY 0117/00 3'-0" X 7'-0" WOOD DOOR, HM FRM | 55.0 | 17.7 | 0.4 | 73.1 | 71.7% | 2.97 | 1,121 | 295 |
| SUBSYSTEM 02 TOTAL | 74.7 | 26.6 | 0.6 | 101.9 | 52.9% | 4.14 | 1,754 | 450 |
| PERCENT OF SUBSYSTEM TOTAL | 73.3% | 26.1% | 0.6% | | | | | |
| SYSTEM 05 TOTAL | 110.5 | 80.2 | 1.8 | 192.5 | 13.0% | 7.82 | 5,084 | 1,168 |
| PERCENT OF SYSTEM TOTAL | 57.4% | 41.7% | 0.9% | | | | | |

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GENERIC DORMITORY MODEL, COMPUTER OUTPUT-ASSEMBLY LEVEL, DEFAULT RUN

| SYSTEM/SUBSYSTEM ASSEMBLY DESCRIPTION | $ MAT (000) | $ LAB (000) | $ EQ (000) | $ TOTAL (000) | % TOT | $/FAC QTY | TOT MH | TOT EH |
|---|---|---|---|---|---|---|---|---|
| SYSTEM 06 INTERIOR FINISHES | | | | | | | | |
| SUBSYSTEM 01 WALL FINISHES | | | | | | | | |
| ASSEMBLY 0301/00 5/8" GYPSUM BOARD ON 7/8" FURRING CHANNEL | 11.5 | 17.0 | 0.4 | 28.9 | 48.4% | 1.17 | 1,071 | 272 |
| ASSEMBLY 0401/00 4-1/4" X 4-1/4" CERAMIC TILE TO WALLS | 12.9 | 9.1 | 0.1 | 22.1 | 37.0% | 0.90 | 522 | 67 |
| ASSEMBLY 0501/00 PAINT TO GYPSUM BOARD WALLS USING ROLLER | 1.6 | 2.5 | 0.0 | 4.1 | 6.9% | 0.17 | 221 | 47 |
| ASSEMBLY 0502/00 PAINT TO CONCRETE BLOCK USING BRUSHES, TWO COATS | 0.0 | 0.0 | 0.0 | 0.0 | 0.0% | 0.00 | 2 | 0 |
| ASSEMBLY 0506/00 EPOXY PAINT TO DRYWALL | 0.5 | 1.0 | 0.0 | 1.5 | 2.5% | 0.06 | 90 | 20 |
| ASSEMBLY 0602/00 MEDIUM WEIGHT VINYL WALLCOVERING WITH FABRIC BACKING | 2.1 | 0.9 | 0.0 | 3.0 | ˉ5.0% | 0.12 | 73 | 7 |
| SUBSYSTEM 01 TOTAL | 28.7 | 30.5 | 0.5 | 59.7 | 38.2% | 2.43 | 1,980 | 413 |
| PERCENT OF SUBSYSTEM TOTAL | 48.1% | 51.1% | 0.8% | | | | | |
| SYSTEM 06 INTERIOR FINISHES | | | | | | | | |
| SUBSYSTEM 02 FLOORING & FLOOR FINISHES | | | | | | | | |
| ASSEMBLY 0101/00 THIN SET NATURAL CLAY CERAMIC TILE FLOOR AND BASE | 17.2 | 11.2 | 0.1 | 28.5 | 53.8% | 1.16 | 646 | 82 |
| ASSEMBLY 0401/00 VINYL TILE, 1/8 "X 12" X 12" | 1.6 | 0.5 | 0.0 | 2.1 | 4.0% | 0.09 | 28 | 4 |
| ASSEMBLY 0501/00 COMMERCIAL GRADE 26 OZ. NYLON CARPET | 18.6 | 3.8 | 0.0 | 22.4 | 42.3% | 0.91 | 389 | 43 |
| SUBSYSTEM 02 TOTAL | 37.4 | 15.5 | 0.1 | 53.0 | 33.9% | 2.16 | 1,063 | 129 |
| PERCENT OF SUBSYSTEM TOTAL | 70.6% | 29.2% | 0.2% | | | | | |
| SYSTEM 06 INTERIOR FINISHES | | | | | | | | |
| SUBSYSTEM 03 CEILING & CEILING FINISHES | | | | | | | | |
| ASSEMBLY 0101/00 EXPOSED CONCRETE FINISH | 1.4 | 12.9 | 0.3 | 14.6 | 33.5% | 0.59 | 1,020 | 130 |
| ASSEMBLY 0301/00 5/8" GYPSUM WALL BOARD CEILING, 1 LAYER, FIRE RATED | 3.1 | 4.1 | 0.1 | 7.3 | 16.7% | 0.30 | 209 | 50 |
| ASSEMBLY 0704/00 SUSPENSION SYSTEM FOR GYPSUM BOARD CEILING | 6.3 | 15.1 | 0.4 | 21.8 | 50.0% | 0.88 | 1,214 | 243 |
| SUBSYSTEM 03 TOTAL | 10.9 | 32.0 | 0.7 | 43.6 | 27.9% | 1.77 | 2,443 | 424 |
| PERCENT OF SUBSYSTEM TOTAL | 25.0% | 73.4% | 1.6% | | | | | |

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GENERIC DORMITORY MODEL, COMPUTER OUTPUT-ASSEMBLY LEVEL, DEFAULT RUN

| SYSTEM/SUBSYSTEM<br>ASSEMBLY DESCRIPTION | $ MAT (000) | $ LAB (000) | $ EQ (000) | $ TOTAL (000) | % TOT | $/FAC QTY | TOT MH | TOT EH |
|---|---|---|---|---|---|---|---|---|
| SYSTEM 06 TOTAL | 76.9 | 78.1 | 1.4 | 156.4 | 10.5% | 6.36 | 5,486 | 965 |
| PERCENT OF SYSTEM TOTAL | 49.2% | 49.9% | 0.9% | | | | | |
| SYSTEM 07 SPECIALTIES | | | | | | | | |
| SUBSYSTEM 01 GENERAL SPECIALTIES | | | | | | | | |
| ASSEMBLY 0102/00 TOILET PARTITION AND ACCESSORIES | 0.6 | 0.1 | 0.0 | 0.7 | 2.8% | 0.03 | 5 | 1 |
| ASSEMBLY 0213/00 ACCESSORIES FOR TYPICAL ENLISTED OR OFFICER DORM UNIT | 8.5 | 5.5 | 0.1 | 14.1 | 56.6% | 0.57 | 394 | 74 |
| ASSEMBLY 0601/00 10" WIDE STOCK PREFINISHED SHELVES WITH SUPPORTS | 5.6 | 4.4 | 0.2 | 10.2 | 41.0% | 0.42 | 277 | 95 |
| SUBSYSTEM 01 TOTAL | 14.7 | 9.9 | 0.3 | 24.9 | 56.5% | 1.01 | 677 | 171 |
| PERCENT OF SUBSYSTEM TOTAL | 59.0% | 39.8% | 1.2% | | | | | |
| SYSTEM 07 SPECIALTIES | | | | | | | | |
| SUBSYSTEM 02 BUILT-IN SPECIALTIES | | | | | | | | |
| ASSEMBLY 0101/00 PLASTIC LAMINATE COUNTERTOP WITH BACKSPLASH | 0.8 | 0.0 | 0.0 | 0.8 | 4.2% | 0.03 | 3 | 1 |
| ASSEMBLY 0202/00 CUSTOM BATHRM VANITY - PREFINISHED W/PLASTIC LAM TOP | 10.3 | 4.3 | 0.1 | 14.7 | 77.0% | 0.60 | 274 | 71 |
| ASSEMBLY 0203/00 KTCHN CAB. - PREFINISHED HARDWD W/PLASTIC LAMINATE TOP | 2.0 | 0.7 | 0.0 | 2.7 | 14.1% | 0.11 | 42 | 11 |
| ASSEMBLY 0204/00 BATHROOM VANITY 30" WIDE X 24" DEEP X 34" HIGH | 0.3 | 0.1 | 0.0 | 0.4 | 2.1% | 0.02 | 7 | 2 |
| ASSEMBLY 0501/00 FIRE EXTINGUISHER CABINET, 8" X 12" X 27" | 0.4 | 0.1 | 0.0 | 0.5 | 2.6% | 0.02 | 4 | 1 |
| SUBSYSTEM 02 TOTAL | 13.8 | 5.2 | 0.1 | 19.1 | 43.3% | 0.78 | 331 | 86 |
| PERCENT OF SUBSYSTEM TOTAL | 72.3% | 27.2% | 0.5% | | | | | |
| SYSTEM 07 TOTAL | 28.5 | 15.2 | 0.4 | 44.1 | 3.0% | 1.79 | 1,007 | 256 |
| PERCENT OF SYSTEM TOTAL | 64.6% | 34.5% | 0.9% | | | | | |
| SYSTEM 08 PLUMBING | | | | | | | | |
| SUBSYSTEM 01 DOMESTIC WATER SUPPLY | | | | | | | | |
| ASSEMBLY 0101/00 COPPER PIPE & FITTINGS | 25.4 | 28.5 | 0.9 | 54.8 | 73.5% | 2.23 | 1,564 | 590 |
| ASSEMBLY 0201/00 VALVES & HYDRANTS | 2.4 | 0.8 | 0.0 | 3.2 | 4.3% | 0.13 | 41 | 11 |

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GENERIC DORMITORY MODEL, COMPUTER OUTPUT-ASSEMBLY LEVEL, DEFAULT RUN

| SYSTEM/SUBSYSTEM ASSEMBLY DESCRIPTION | $ MAT (000) | $ LAB (000) | $ EQ (000) | $ TOTAL (000) | % TOT | $/FAC QTY | TOT MH | TOT EH |
|---|---|---|---|---|---|---|---|---|
| ASSEMBLY 0306/00 DOMESTIC HOT WATER HEATERS | 3.7 | 0.4 | 0.0 | 4.1 | 5.5% | 0.17 | 24 | 7 |
| ASSEMBLY 0401/00 FIBERGLASS 1-1/2" PIPE INSULATION WITH VAPOR BARRIER | 8.9 | 3.2 | 0.1 | 12.2 | 16.4% | 0.50 | 288 | 78 |
| SUBSYSTEM 01 TOTAL | 40.6 | 33.0 | 1.0 | 74.6 | 43.0% | 3.03 | 1,917 | 686 |
| PERCENT OF SUBSYSTEM TOTAL | 54.4% | 44.2% | 1.4% | | | | | |
| SYSTEM 08 PLUMBING | | | | | | | | |
| SUBSYSTEM 02 SANITARY WASTE & VENT SYSTEM | | | | | | | | |
| ASSEMBLY 0101/00 WASTE PIPE & FITTINGS ORDINARY FAC. | 12.3 | 11.7 | 0.3 | 24.3 | 80.2% | 0.99 | 717 | 192 |
| ASSEMBLY 0201/00 C.I. NO HUB VENT PIPE SYSTM | 2.5 | 3.1 | 0.1 | 5.7 | 18.8% | 0.23 | 195 | 52 |
| ASSEMBLY 0304/00 MEDIUM DUTY AND HEAVY DUTY CAST IRON FLOOR DRAINS, ADTL | 0.1 | 0.2 | 0.0 | 0.3 | 1.0% | 0.01 | 11 | 3 |
| SUBSYSTEM 02 TOTAL | 15.0 | 15.0 | 0.3 | 30.3 | 17.5% | 1.23 | 923 | 248 |
| PERCENT OF SUBSYSTEM TOTAL | 49.5% | 49.5% | 1.0% | | | | | |
| SYSTEM 08 PLUMBING | | | | | | | | |
| SUBSYSTEM 03 RAINWATER DRAINAGE SYSTEM | | | | | | | | |
| ASSEMBLY 0101/00 RAINWATER DRAINAGE PIPING | 7.3 | 5.5 | 0.1 | 12.9 | 77.2% | 0.53 | 335 | 95 |
| ASSEMBLY 0203/00 4" TO 3" CAST IRON ROOF DRAINS WITH ALUMINUM DOME | 3.0 | 0.8 | 0.0 | 3.8 | 22.8% | 0.16 | 53 | 14 |
| SUBSYSTEM 03 TOTAL | 10.3 | 6.3 | 0.1 | 16.7 | 9.6% | 0.68 | 388 | 109 |
| PERCENT OF SUBSYSTEM TOTAL | 61.7% | 37.7% | 0.6% | | | | | |
| SYSTEM 08 PLUMBING | | | | | | | | |
| SUBSYSTEM 04 PLUMBING FIXTURES | | | | | | | | |
| ASSEMBLY 0101/00 FLOOR MOUNTED - WATER CLOSET | 4.2 | 2.4 | 0.1 | 6.7 | 13.0% | 0.27 | 150 | 40 |
| ASSEMBLY 0304/00 26" BY 18" WHITE OVAL LAVATORY | 11.4 | 3.5 | 0.1 | 15.0 | 29.0% | 0.61 | 219 | 59 |
| ASSEMBLY 0308/00 CAST IRON, WALLHUNG LAVATORY | 0.2 | 0.0 | 0.0 | 0.2 | 0.4% | 0.01 | 3 | 1 |
| ASSEMBLY 0401/00 STAINLESS STEEL - SINGLE BOWL | 0.5 | 0.2 | 0.0 | 0.7 | 1.4% | 0.03 | 11 | 3 |
| ASSEMBLY 0403/00 25" BY 22" SINGLE BOWL KITCHEN SINK OF STAINLESS STEEL | 0.3 | 0.1 | 0.0 | 0.4 | 0.8% | 0.02 | 9 | 2 |

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GENERIC DORMITORY MODEL, COMPUTER OUTPUT-ASSEMBLY LEVEL, DEFAULT RUN

| SYSTEM/SUBSYSTEM ASSEMBLY DESCRIPTION | $ MAT (000) | $ LAB (000) | $ EQ (000) | $ TOTAL (000) | % TOT | $/FAC QTY | TOT MH | TOT EH |
|---|---|---|---|---|---|---|---|---|
| ASSEMBLY 0407/00 JANITOR SINK - FLOOR TYPE | 1.1 | 0.1 | 0.0 | 1.2 | 2.3% | 0.05 | 9 | 2 |
| ASSEMBLY 0505/00 PORCEL.IN ENAMELED STEEL BATHTUB | 15.5 | 11.4 | 0.3 | 27.2 | 52.6% | 1.10 | 738 | 199 |
| ASSEMBLY 0601/00 8 GPH ELECTIC WATER COOLER - WALL MOUNTED | 0.4 | 0.1 | 0.0 | 0.5 | 1.0% | 0.02 | 4 | 1 |
| SUBSYSTEM 04 TOTAL | 33.5 | 17.8 | 0.4 | 51.7 | 29.8% | 2.10 | 1,143 | 307 |
| PERCENT OF SUBSYSTEM TOTAL | 64.8% | 34.4% | 0.8% | | | | | |
| SYSTEM 08 TOTAL | 99.3 | 72.1 | 1.9 | 173.3 | 11.7% | 7.04 | 4,371 | 1,350 |
| PERCENT OF SYSTEM TOTAL | 57.3% | 41.6% | 1.1% | | | | | |
| SYSTEM 09 H.V.A.C | | | | | | | | |
| SUBSYSTEM 01 ENERGY SUPPLY | | | | | | | | |
| ASSEMBLY 0206/00 900 MBH GAS SUPPLY | 1.2 | 0.4 | 0.0 | 1.6 | 100.0% | 0.07 | 26 | 7 |
| SUBSYSTEM 01 TOTAL | 1.2 | 0.4 | 0.0 | 1.6 | 1.3% | 0.07 | 26 | 7 |
| PERCENT OF SUBSYSTEM TOTAL | 75.0% | 25.0% | 0.0% | | | | | |
| SYSTEM 09 H.V.A.C | | | | | | | | |
| SUBSYSTEM 02 HEAT GENERATING SYSTEM | | | | | | | | |
| ASSEMBLY 0216/00 HOT WATER BOILER, GAS FIRED 320 MBH | 7.1 | 2.8 | 0.1 | 10.0 | 100.0% | 0.40 | 164 | 50 |
| SUBSYSTEM 02 TOTAL | 7.1 | 2.8 | 0.1 | 10.0 | 8.4% | 0.40 | 164 | 50 |
| PERCENT OF SUBSYSTEM TOTAL | 71.0% | 28.0% | 1.0% | | | | | |
| SYSTEM 09 H.V.A.C | | | | | | | | |
| SUBSYSTEM 03 COOLING GENERATING SYSTEM | | | | | | | | |
| ASSEMBLY 0103/00 30 TON AIR COOLED RECIP. CHILLER W/MECH. ROOM PIPING | 18.8 | 4.5 | 0.2 | 23.5 | 100.0% | 0.96 | 251 | 115 |
| SUBSYSTEM 03 TOTAL | 18.8 | 4.5 | 0.2 | 23.5 | 19.7% | 0.96 | 251 | 115 |
| PERCENT OF SUBSYSTEM TOTAL | 80.0% | 19.1% | 0.9% | | | | | |
| SYSTEM 09 H.V.A.C | | | | | | | | |
| SUBSYSTEM 04 DISTRIBUTION SYSTEMS | | | | | | | | |
| ASSEMBLY 0101/00 .3 MCFM FAN COIL UNIT ASSEMBLY | 19.1 | 7.8 | 0.2 | 27.1 | 45.4% | 1.10 | 434 | 123 |

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GENERIC DORMITORY MODEL, COMPUTER OUTPUT-ASSEMBLY LEVEL, DEFAULT RUN

| SYSTEM/SUBSYSTEM ASSEMBLY DESCRIPTION | $ MAT (000) | $ LAB (000) | $ EQ (000) | $ TOTAL (000) | % TOT | $/FAC QTY | TOT MH | TOT EH |
|---|---|---|---|---|---|---|---|---|
| ASSEMBLY 0116/00 1.6MCFM AHU WITH HEAT COIL & OUTSIDE AIR INTAKE | 1.1 | 0.3 | 0.0 | 1.4 | 2.3% | 0.06 | 20 | 5 |
| ASSEMBLY 0704/00 CHILLED WATER DISTRIBUTION FOR BOQ (40 TONS 83 UNITS) | 13.9 | 16.7 | 0.5 | 31.1 | 52.1% | 1.27 | 1,043 | 340 |
| SUBSYSTEM 04 TOTAL | 34.1 | 24.9 | 0.7 | 59.7 | 50.0% | 2.43 | 1,497 | 469 |
| PERCENT OF SUBSYSTEM TOTAL | 57.1% | 41.7% | 1.2% | | | | | |
| SYSTEM 09 H.V.A.C | | | | | | | | |
| SUBSYSTEM 07 SYSTEMS TESTING & BALANCING | | | | | | | | |
| ASSEMBLY 0102/00 WATER TEST & BALANCE BOILER | 0.2 | 0.1 | 0.0 | 0.3 | 2.3% | 0.01 | 7 | 2 |
| ASSEMBLY 0105/00 WATER, TEST & BALANCE CHILLER | 0.0 | 0.1 | 0.0 | 0.1 | 0.8% | 0.00 | 3 | 1 |
| ASSEMBLY 0107/00 WATER, TEST & BALANCE FAN COIL, FIN TUBE | 0.0 | 1.5 | 0.0 | 1.5 | 11.4% | 0.06 | 80 | 23 |
| ASSEMBLY 0109/00 WATER, TEST & BALANCE PUMP | 0.0 | 0.2 | 0.0 | 0.2 | 1.5% | 0.01 | 10 | 3 |
| ASSEMBLY 0202/00 TEST & BALANCE H & V UNIT/IN LINE FAN | 0.0 | 8.9 | 0.2 | 9.1 | 68.9% | 0.37 | 475 | 129 |
| ASSEMBLY 0204/00 TEST & BALANCE ROOF EXHAUST FAN | 0.0 | 0.1 | 0.0 | 0.1 | 0.8% | 0.01 | 8 | 2 |
| ASSEMBLY 0212/00 TEST & BALANCE REGISTER AVERAGE CEILING HEIGHT | 0.0 | 1.8 | 0.0 | 1.8 | 13.6% | 0.07 | 95 | 26 |
| SUBSYSTEM 07 TOTAL | 0.2 | 12.7 | 0.3 | 13.2 | 11.0% | 0.53 | 677 | 186 |
| PERCENT OF SUBSYSTEM TOTAL | 1.5% | 96.2% | 2.3% | | | | | |
| SYSTEM 09 H.V.A.C | | | | | | | | |
| SUBSYSTEM 08 VENTILATING/EXHAUST SYSTEMS | | | | | | | | |
| ASSEMBLY 0130/00 .2 MCFM EXHAUST SYSTEM FOR BOQ | 0.5 | 0.1 | 0.0 | 0.6 | 5.1% | 0.02 | 6 | 2 |
| ASSEMBLY 0194/00 1.95 MCFM EXHAUST SYSTEM FOR BOQ | 8.4 | 2.7 | 0.1 | 11.2 | 94.9% | 0.45 | 168 | 49 |
| SUBSYSTEM 08 TOTAL | 8.9 | 2.8 | 0.1 | 11.8 | 9.9% | 0.48 | 174 | 50 |
| PERCENT OF SUBSYSTEM TOTAL | 75.4% | 23.7% | 0.9% | | | | | |
| SYSTEM 09 TOTAL | 70.2 | 48.1 | 1.2 | 119.5 | 8.0% | 4.86 | 2,789 | 878 |
| PERCENT OF SYSTEM TOTAL | 58.7% | 40.3% | 1.0% | | | | | |

SYSTEM 10 SPECIAL MECHANICAL SYSTEMS
SUBSYSTEM 01 FIRE PROTECTION

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GENERIC DORMITORY MODEL, COMPUTER OUTPUT-ASSEMBLY LEVEL, DEFAULT RUN

| SYSTEM/SUBSYSTEM ASSEMBLY DESCRIPTION | $ MAT (000) | $ LAB (000) | $ EQ (000) | $ TOTAL (000) | % TOT | $/FAC QTY | TOT MH | TOT EH |
|---|---|---|---|---|---|---|---|---|
| ASSEMBLY 0105/00 FIRE PROTECTION WATER SUPPLY | 6.1 | 0.6 | 0.0 | 6.7 | 23.5% | 0.28 | 35 | 10 |
| ASSEMBLY 0202/00 CONCEALED SPRINKLER HEADS, PIPES & FITTINGS -ORD. HAZ. | 21.8 | 0.0 | 0.0 | 21.8 | 76.5% | 0.88 | 0 | 0 |
| SUBSYSTEM 01 TOTAL | 27.9 | 0.6 | 0.0 | 28.5 | 100.0% | 1.16 | 35 | 10 |
| PERCENT OF SUBSYSTEM TOTAL | 97.9% | 2.1% | 0.0% | | | | | |
| SYSTEM 10 TOTAL | 27.9 | 0.6 | 0.0 | 28.5 | 1.9% | 1.16 | 35 | 10 |
| PERCENT OF SYSTEM TOTAL | 97.9% | 2.1% | 0.0% | | | | | |
| SYSTEM 11 ELECTRICAL | | | | | | | | |
| SUBSYSTEM 01 SERVICE AND DISTRIBUTION | | | | | | | | |
| ASSEMBLY 0103/00 UNGRD 600 AMP MAIN TRANSFORMER | 11.1 | 2.1 | 0.1 | 13.3 | 19.1% | 0.54 | 94 | 13 |
| ASSEMBLY 0206/00 UNGRD 600 AMP SECONDARY | 3.6 | 2.5 | 0.0 | 6.1 | 8.7% | 0.25 | 120 | 12 |
| ASSEMBLY 0306/00 UNGRD 600 AMP MAIN SWITCHBOARD | 30.1 | 2.6 | 0.0 | 32.7 | 46.8% | 1.33 | 113 | 10 |
| ASSEMBLY 0501/00 PANELBD 208V 100A 24 CIR MLO W/BKR | 1.8 | 2.5 | 0.0 | 4.3 | 6.2% | 0.18 | 116 | 11 |
| ASSEMBLY 0506/00 PANELBD 208V 225A 36 CIR MLO W/BKR | 3.3 | 3.5 | 0.0 | 6.8 | 9.7% | 0.28 | 161 | 15 |
| ASSEMBLY 0536/00 PANELBD 480V 225A 36 CIR MLO W/BKR | 1.7 | 1.5 | 0.0 | 3.2 | 4.6% | 0.13 | 67 | 6 |
| ASSEMBLY 0537/00 PANELBD 480V 225A 42 CIR MLO W/BKR | 1.8 | 1.5 | 0.0 | 3.3 | 4.7% | 0.13 | 70 | 7 |
| SUBSYSTEM 01 TOTAL | 53.4 | 16.3 | 0.1 | 69.8 | 24.5% | 2.84 | 742 | 75 |
| PERCENT OF SUBSYSTEM TOTAL | 76.5% | 23.4% | 0.1% | | | | | |
| SYSTEM 11 ELECTRICAL | | | | | | | | |
| SUBSYSTEM 02 LIGHTING & POWER | | | | | | | | |
| ASSEMBLY 0102/00 120 VOLT, 20 AMP DUPLEX RECEPTACLE - MASONRY PARTITION | 12.0 | 42.6 | 0.3 | 54.9 | 25.6% | 2.23 | 1,966 | 183 |
| ASSEMBLY 0103/00 DUPLEX RECEPTACLE LONG RUN | 3.6 | 13.8 | 0.1 | 17.5 | 8.2% | 0.71 | 646 | 61 |
| ASSEMBLY 0107/00 120 VOLT, 15 AMP DUPLEX GROUND FAULT RECEPTACLE | 2.1 | 5.7 | 0.0 | 7.8 | 3.6% | 0.32 | 266 | 23 |
| ASSEMBLY 0108/00 DUPLEX GFI RECEPTACLE LONG RUN | 0.6 | 2.0 | 0.0 | 2.6 | 1.2% | 0.10 | 92 | 8 |
| ASSEMBLY 0122/00 230 VOLT, 30 AMP RECEPTACLE - MASONRY PARTITION | 7.0 | 14.8 | 0.1 | 21.9 | 10.2% | 0.89 | 692 | 66 |

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GENERIC DORMITORY MODEL, COMPUTER OUTPUT-ASSEMBLY LEVEL, DEFAULT RUN

| SYSTEM/SUBSYSTEM ASSEMBLY DESCRIPTION | $ MAT (000) | $ LAB (000) | $ EQ (000) | $ TOTAL (000) | % TOT | $/FAC QTY | TOT MH | TOT EH |
|---|---|---|---|---|---|---|---|---|
| ASSEMBLY 0136/00 EQUIPMENT CONNECTIONS FOR UP TO 5 HP | 0.6 | 1.2 | 0.0 | 1.8 | 0.8% | 0.07 | 56 | 5 |
| ASSEMBLY 0138/00 480 VOLT EQUIPMENT CONNECTIONS FOR MOTORS - 15 TO 25 HP | 0.3 | 0.5 | 0.0 | 0.8 | 0.4% | 0.03 | 22 | 2 |
| ASSEMBLY 0156/00 120V 20A SINGLE POLE SWITCH | 1.5 | 5.5 | 0.0 | 7.0 | 3.3% | 0.29 | 257 | 23 |
| ASSEMBLY 0201/00 FOUR FOOT STRIP FLOURESCENT FIXTURE | 2.3 | 7.1 | 0.0 | 9.4 | 4.4% | 0.38 | 335 | 32 |
| ASSEMBLY 0202/00 2' X 4' LAY-IN FLUORESCENT FIXTURE | 0.1 | 0.2 | 0.0 | 0.3 | 0.1% | 0.01 | 8 | 1 |
| ASSEMBLY 0204/00 277 VOLT 2' X 4' FLUORESCENT FIXTURE | 0.4 | 0.4 | 0.0 | 0.8 | 0.4% | 0.03 | 16 | 2 |
| ASSEMBLY 0209/00 SURFACE MOUNT 2' X 4' FLUORESCENT FIXTURE | 0.5 | 0.5 | 0.0 | 1.0 | 0.5% | 0.04 | 24 | 2 |
| ASSEMBLY 0211/00 4' 2 LAMP WALL MOUNT FLORESCENT | 13.7 | 15.9 | 0.1 | 29.7 | 13.8% | 1.21 | 746 | 71 |
| ASSEMBLY 0214/00 SURFACE MOUNTED 1' X 4' FLUORESCENT FIXTURE | 8.7 | 18.0 | 0.1 | 26.8 | 12.5% | 1.09 | 844 | 81 |
| ASSEMBLY 0220/00 CEILING RECESSED INCANDESCENT 100 WATT FIXTURE | 0.4 | 0.6 | 0.0 | 1.0 | 0.5% | 0.04 | 30 | 3 |
| ASSEMBLY 0230/00 100W MERCURY VAPOR WALLMOUNT | 0.6 | 1.7 | 0.0 | 2.3 | 1.1% | 0.09 | 74 | 7 |
| ASSEMBLY 0235/00 150 WATT HPS RECESSED FIXTURE | 0.2 | 0.2 | 0.0 | 0.4 | 0.2% | 0.02 | 9 | 1 |
| ASSEMBLY 0249/00 150W PENDANT MOUNT INDUSTRIAL FIXTURE | 5.8 | 11.7 | 0.1 | 17.6 | 8.2% | 0.71 | 545 | 52 |
| ASSEMBLY 0272/00 EXIT LIGHT WITH BATTERY BACKUP | 0.6 | 1.1 | 0.0 | 1.7 | 0.8% | 0.07 | 48 | 4 |
| ASSEMBLY 0274/00 6V EMERGENCY BATTERY PACK | 0.4 | 0.3 | 0.0 | 0.7 | 0.3% | 0.03 | 16 | 1 |
| ASSEMBLY 0276/00 PORCELAIN LAMP HOLDER | 1.5 | 7.2 | 0.0 | 8.7 | 4.1% | 0.36 | 337 | 32 |
| SUBSYSTEM 02 TOTAL | 62.7 | 151.1 | 0.9 | 214.7 | 75.5% | 8.73 | 7,029 | 661 |
| PERCENT OF SUBSYSTEM TOTAL | 29.2% | 70.4% | 0.4% | | | | | |
| SYSTEM 11 TOTAL | 116.1 | 167.3 | 1.0 | 284.4 | 19.1% | 11.56 | 7,771 | 737 |
| PERCENT OF SYSTEM TOTAL | 40.8% | 58.8% | 0.4% | | | | | |
| SYSTEM 12 SPECIAL ELECTRICAL SYSTEMS | | | | | | | | |
| SUBSYSTEM 01 COMMUNICATION & ALARM SYSTEMS | | | | | | | | |
| ASSEMBLY 0102/00 FIRE ALARM SYSTEM - RATE OF RISE HEAT DETECTORS | 7.6 | 19.5 | 0.1 | 27.2 | 59.6% | 1.11 | 911 | 85 |

[> CONTINUED NEXT PAGE <]

GENERIC DORMITORY MODEL, COMPUTER OUTPUT-ASSEMBLY LEVEL, DEFAULT RUN

| SYSTEM/SUBSYSTEM ASSEMBLY DESCRIPTION | $ MAT (000) | $ LAB (000) | $ EQ (000) | $ TOTAL (000) | % TOT | $/FAC QTY | TOT MH | TOT EH |
|---|---|---|---|---|---|---|---|---|
| ASSEMBLY 0104/00 FIRE ALARM DUCT SMOKE DETECTOR | 0.3 | 0.3 | 0.0 | 0.6 | 1.3% | 0.02 | 13 | 1 |
| ASSEMBLY 0118/00 12-ZONE FACP WITH ANNUM AND TRANSMITTER | 9.9 | 1.6 | 0.0 | 11.5 | 25.2% | 0.47 | 70 | 6 |
| ASSEMBLY 0301/00 TELEPHONE SYSTEM, 2 PAIR | 1.2 | 2.4 | 0.0 | 3.6 | 7.9% | 0.15 | 112 | 11 |
| ASSEMBLY 0701/00 TELEVISION OUTLET COMPLETE WITH WIRE AND CONDUIT | 1.7 | 0.9 | 0.0 | 2.6 | 5.7% | 0.11 | 38 | 3 |
| ASSEMBLY 0702/00 MASTER TELEVISION ANTENNA WITH POLE | 0.1 | 0.0 | 0.0 | 0.1 | 0.2% | 0.00 | 1 | 0 |
| SUBSYSTEM 01 TOTAL | 20.8 | 24.7 | 0.1 | 45.6 | 100.0% | 1.85 | 1,144 | 107 |
| PERCENT OF SUBSYSTEM TOTAL | 45.6% | 54.2% | 0.2% | | | | | |
| SYSTEM 12 TOTAL | 20.8 | 24.7 | 0.1 | 45.6 | 3.1% | 1.85 | 1,144 | 107 |
| PERCENT OF SYSTEM TOTAL | 45.6% | 54.2% | 0.2% | | | | | |
| SYSTEM 13 EQUIPMENT | | | | | | | | |
| SUBSYSTEM 03 FURNISHINGS | | | | | | | | |
| ASSEMBLY 0201/00 HORIZONTAL BLINDS | 2.9 | 0.3 | 0.0 | 3.2 | 100.0% | 0.13 | 19 | 5 |
| SUBSYSTEM 03 TOTAL | 2.9 | 0.3 | 0.0 | 3.2 | 100.0% | 0.13 | 19 | 5 |
| PERCENT OF SUBSYSTEM TOTAL | 90.6% | 9.4% | 0.0% | | | | | |
| SYSTEM 13 TOTAL | 2.9 | 0.3 | 0.0 | 3.2 | 0.2% | 0.13 | 19 | 5 |
| PERCENT OF SYSTEM TOTAL | 90.6% | 9.4% | 0.0% | | | | | |
| FACILITY TOTAL | 806.4 | 660.1 | 19.6 | 1,486.1 | 100.0% | 60.41 | 40,599 | 8,590 |
| PERCENT OF FACILITY TOTAL | 54.3% | 44.4% | 1.3% | | | | | |

# APPENDIX B

# GENERIC NURSING HOME MODEL

## GENERIC NURSING HOME MODEL, INPUT PARAMETERS, PROJECT DEFINITION RUN

| | UM | MODEL/ESTIMATED QUANTITY | USER QUANTITY |
|---|---|---|---|
| **MINIMUM PARAMETERS:** | | | |
| GROSS FLOOR AREA | SF | 21058 | 21058 |
| MODEL FULL SCOPE | SF | 20674 | 20674 |
| MODEL HALF SCOPE | SF | 384 | 384 |
| PROJECT TOTAL SCOPE | SF | 20866 | 20866 |
| PROJECT FULL SCOPE | SF | 20674 | 20674 |
| PROJECT HALF SCOPE | SF | 192 | 192 |
| STORIES ABOVE GRADE | ST | 2 | 1 * |
| **LOCATION MODIFIERS:** | | | |
| SEISMIC ZONE | NA | 0 | 0 |
| A/C WEATHER ZONE | NA | B | B |
| HEATING/INSULATION ZONE | NA | C | C |
| FROST LINE DEPTH | IN | 2 | 2 |
| **FUNCTIONAL SPACE AREAS:** | | | |
| COVERED WALKWAYS AND SERVICE AREAS | SF | 384 | 0 * |
| LAUNDRY, STORAGE, AND MAID'S ROOM | SF | 1414 | 1200 * |
| LOUNGE AND GAME ROOM | SF | 1309 | 600 * |
| MECHANICAL, ELECTRICAL, & BUILDING SUPPORT | SF | 1967 | 0 * |
| ENLISTED QUARTERS (544 SF/UNIT) | SF | 15984 | 7760 * |
| ADMIN MODULE - MEDIUM | SF | 0 | 720 * |
| BUILDING SUPPORT AREA | SF | 0 | 5850 * |
| COVERED EXTERIOR ENTRYWAY | SF | 0 | 384 * |
| DINING AREA; 40-250 PERSONS | SF | 0 | 3200 * |
| NURSING | SF | 0 | 400 * |
| CLOSED OFFICE SPACE | SF | 0 | 544 * |
| GENERAL PURPOSE STORAGE | SF | 0 | 400 * |
| **QUANTITY PARAMETERS:** | | | |
| FLOOR TO FLOOR HEIGHT ABOVE GRADE | FT | 9 | 12 * |
| FLOOR TO FLOOR HEIGHT BELOW GRADE | FT | 12 | 0 * |
| FLOOR TO CEILING HEIGHT ABOVE GRADE | FT | 8 | 10 * |
| FLOOR TO CEILING HEIGHT BELOW GRADE | FT | 9 | 0 * |
| FOOTPRINT | SF | 21058 | 21058 |
| AIR CHANGES PER HOUR | ACH | .34652 | .34652 |
| PLUMBING DOMESTIC WATER SUPPLY | EA | 104 | 104 |
| PLUMBING SANITARY WASTE SYSTEM | EA | 108 | 108 |
| PERIMETER | LF | 1103 | 1103 |
| ROOF AREA | SF | 22290 | 22290 |

* THIS VALUE WAS INPUT BY THE USER.

GENERIC NURSING HOME MODEL, INPUT PARAMETERS, PROJECT DEFINITION RUN

| | UM | MODEL/ESTIMATED QUANTITY | USER QUANTITY |
|---|---|---|---|
| **QUANTITY PARAMETERS:** | | | |
| EXTERIOR WALL AREA | SF | 10662 | 14216 * |
| EXTERIOR WINDOW AREA | SF | 785 | 1047 * |
| HEATING LOAD | MBH | 255 | 255 |
| COOLING LOAD | TONS | 20.18 | 20.18 |
| ELECTRIC LOAD | AMPS | 447 | 447 |
| EXTERIOR DOORS | EA | 14 | 14 |
| **DESCRIPTIVE PARAMETERS:** | | | |
| SOIL TYPE | | AVG BEARING CAP | AVG BEARING CAP |
| FLOOR STRUCTURE TYPE | | N/A | N/A |
| ROOF STRUCTURE TYPE | | STEEL LITE JOIS | LOAD BEAR-TRUSS * |
| BAY SIZE / SPAN LENGTH | | 30 - 50 LF | 0 - 30 LF * |
| STAIR TYPE | | N/A | N/A |
| ROOFING TYPE | | STAND SEAM METL | SHINGLE * |
| EXTERIOR WALL TYPE | | BRICK VENEER | CONCRETE BLOCK * |
| HEAT GENERATING SYSTEMS | | WATER BOILR GAS | WATER BOILR GAS |
| COOLING GENERATING SYSTEMS | | RECIPROC CHILLR | RECIPROC CHILLR |
| **DENSITY PARAMETERS - FSA:** | | | |
| INTERIOR PARTITIONS - LAUNDRY, STORAGE & MAID RM | SF | 744 | 744 |
| INTERIOR DOORS - LAUNDRY, STORAGE & MAID RM | EA | 1 | 1 |
| INT WALL FINISH - LAUNDRY, STORAGE & MAID RM | SF | 2969 | 2969 |
| PLUMBING FIXTURES - LAUNDRY, STORAGE & MAID RM | EA | 10 | 10 |
| INTERIOR PARTITIONS - LOUNGE AND GAME ROOM | SF | 201 | 201 |
| INTERIOR DOORS - LOUNGE AND GAME ROOM | EA | 1 | 1 |
| INT WALL FINISH - LOUNGE AND GAME ROOM | SF | 1122 | 1122 |
| PLUMBING FIXTURES - LOUNGE AND GAME ROOM | EA | 2 | 2 |
| INTERIOR PARTITIONS - ENLISTED QUARTERS | SF | 20182 | 20182 |
| INTERIOR DOORS - ENLISTED QUARTERS | EA | 86 | 86 |
| INT WALL FINISH - ENLISTED QUARTERS | SF | 36803 | 36803 |
| PLUMBING FIXTURES - ENLISTED QUARTERS | EA | 57 | 57 |
| INTERIOR PARTITIONS - ADMIN MODULE - MEDIUM | SF | 936 | 936 |
| INTERIOR DOORS - ADMIN MODULE - MEDIUM | EA | 3 | 3 |
| INT WALL FINISH - ADMIN MODULE - MEDIUM | SF | 1789 | 1789 |
| PLUMBING FIXTURES - ADMIN MODULE - MEDIUM | EA | 2 | 2 |
| INTERIOR PARTITIONS - BUILDING SUPPORT AREA | SF | 6511 | 6511 |
| INTERIOR DOORS - BUILDING SUPPORT AREA | EA | 30 | 30 |
| INTERIOR WINDOWS - BUILDING SUPPORT AREA | SF | 266 | 266 |
| INT WALL FINISH - BUILDING SUPPORT AREA | SF | 7605 | 7605 |

GENERIC NURSING HOME MODEL, INPUT PARAMETERS, PROJECT DEFINITION RUN

| | UM | MODEL/ESTIMATED QUANTITY | USER QUANTITY |
|---|---|---|---|
| DENSITY PARAMETERS - FSA: | | | |
| PLUMBING FIXTURES - BUILDING SUPPORT AREA | EA | 25 | 25 |
| INTERIOR PARTITIONS - DINE AREA;40/250 PERSONS | SF | 2581 | 2581 |
| INTERIOR DOORS - DINE AREA;40-250 PERSONS | EA | 3 | 3 |
| INTERIOR WINDOWS - DINE AREA;40-250 PERSONS | SF | 100 | 100 |
| INT WALL FINISH - DINE AREA;40-250 PERSONS | SF | 2952 | 2952 |
| PLUMBING FIXTURES - DINE AREA;40-250 PERSONS | EA | 5 | 5 |
| INTERIOR PARTITIONS - NURSING | SF | 704 | 704 |
| INTERIOR DOORS - NURSING | EA | 2 | 2 |
| INT WALL FINISH - NURSING | SF | 1362 | 1362 |
| PLUMBING FIXTURES - NURSING | EA | 2 | 2 |
| INTERIOR PARTITIONS - CLOSED OFFICE SPACE | SF | 580 | 580 |
| INTERIOR DOORS - CLOSED OFFICE SPACE | EA | 2 | 2 |
| INTERIOR WINDOWS - CLOSED OFFICE SPACE | SF | 3 | 3 |
| INT WALL FINISH - CLOSED OFFICE SPACE | SF | 1503 | 1503 |
| INTERIOR PARTITIONS - GENRL PURPOSE STORAGE | SF | 474 | 474 |
| INTERIOR DOORS - GENRL PURPOSE STORAGE | EA | 3 | 3 |
| INT OH & SPEC DOORS - GENRL PURPOSE STORAGE | SF | 18 | 18 |
| INT WALL FINISH - GENRL PURPOSE STORAGE | SF | 1054 | 1054 |

GENERIC NURSING HOME MODEL, INPUT PARAMETERS, PROJECT DEFINITION RUN

| | | UM | MODEL/ESTIMATED QUANTITY | USER QUANTITY |
|---|---|---|---|---|
| 01 | SUBSTRUCTURE | | | |
| 0101 | STANDARD FOUNDATION | SF | 21,058.000 | 21,058.000 |
| 0101 01 | WALL FOUNDATIONS | LF | 4,200.000 | 4,200.000 |
| 0101 0102 | 1' X 2' STRIP FOOTING, 3,000 PSI | LF | 588.000 | 588.000 |
| 0101 0103 | 1'0" X 3'0" STRIP FOOTING 3000 PSI | LF | 1,806.000 | 1,806.000 |
| 0101 0131 | 15" THICK CONRETE FOUNDATION WALL 4000 PSI, 16" DEEP | LF | 1,806.000 | 1,806.000 |
| 0101 02 | COLUMN FOUNDATIONS & PILE CAPS | SF | 21,058.000 | 21,058.000 |
| 0101 0201 | SPREAD FOOTING | CY | 15.000 | 15.000 |
| 0101 0241 | SPREAD FTG, REINFORCING STEEL | TONS | 1.000 | 1.000 |
| 0101 0277 | SPREAD FTG COL BOLTS | EA | 211.000 | 211.000 |
| 0102 | SPECIAL FOUNDATION CONDITIONS | SF | 21,058.000 | 21,058.000 |
| 0102 01 | PILE FOUNDATIONS | SF | 21,058.000 | 21,058.000 |
| 0103 | SLAB ON GRADE | SF | 21,058.000 | 21,058.000 |
| 0103 01 | STANDARD SLAB ON GRADE | SF | 21,058.000 | 21,058.000 |
| 0103 0102 | 5" STANDARD SLAB ON GRADE | SF | 21,058.000 | 21,058.000 |
| 02 | SUPERSTRUCTURE | | | |
| 0202 | ROOF CONSTRUCTION | SF | 22,290.000 | 22,290.000 |
| 0202 01 | STRUCTURAL FRAME | SF | 22,290.000 | 22,290.000 |
| 0202 0130 | WOOD TRUSS ROOF FRAMING W/ 3/4" PLYWD ROOF DECK | SF | 22,290.000 | 22,290.000 |
| 0202 02 | STRUCTURAL INTERIOR WALLS | SF | 11,079.000 | 11,079.000 |
| 0202 0203 | 8" INTERIOR LOAD BRG CONCRETE MASONRY UNIT WALL | SF | 11,079.000 | 11,079.000 |
| 03 | ROOFING | | | |
| 0301 | ROOFING | SF | 22,290.000 | 22,290.000 |
| 0301 01 | ROOF COVERINGS | SF | 22,290.000 | 22,290.000 |
| 0301 0105 | STRIP SHINGLES, 4" SLOPE, MULTI-LAYERED, CLASS A | SF | 22,290.000 | 22,290.000 |
| 0301 03 | ROOF INSULATION & FILL | SF | 22,290.000 | 22,290.000 |
| 0301 0307 | 1" RIGID INSULATION (2 LAYERS) | SF | 22,290.000 | 22,290.000 |
| 0301 04 | FLASHINGS & TRIM | SF | 1,809.000 | 1,809.000 |
| 0301 0405 | MISC. ROOFING ITEMS - 12" GRAVEL STOP | LF | 1,809.000 | 1,809.000 |
| 04 | EXTERIOR CLOSURE | | | |
| 0401 | EXTERIOR WALLS | SF | 14,216.000 | 14,216.000 |
| 0401 01 | EXTERIOR SKIN | SF | 12,776.000 | 12,776.000 |
| 0401 0110 | 8" LOAD BEARING CONCRETE BLOCK EXTERIOR CLOSURE WALL | SF | 12,776.000 | 12,776.000 |
| 0401 02 | INSULATION & VAPOR BARRIER | SF | 12,776.000 | 12,776.000 |

GENERIC NURSING HOME MODEL, INPUT PARAMETERS, PROJECT DEFINITION RUN

| | | UM | MODEL/ESTIMATED QUANTITY | USER QUANTITY |
|---|---|---|---|---|
| 0401 0201 | POLYSTYRENE RIGID WALL INSULATION, 1" THICK | SF | 12,776.000 | 12,776.000 |
| 0401 03 | INTERIOR SKIN | SF | 14,216.000 | 14,216.000 |
| 0401 0301 | 3 5/8" MTL. STUD NON-LOAD BEARING INTERIOR SKIN | SF | 11,906.000 | 11,906.000 |
| 0401 0304 | REINFORCED 8" CONCRETE MASONRY UNIT BACK-UP WALL | SF | 2,310.000 | 2,310.000 |
| 0401 05 | EXTERIOR LOUVERS & SCREENS | SF | 46.000 | 46.000 |
| 0401 0501 | FIXED BLADE EXTERIOR LOUVER WITH BAKED ENAMEL FINISH | SF | 46.000 | 46.000 |
| 0401 07 | BALCONY WALLS & HANDRAILS | LF | 667.000 | 667.000 |
| 0401 0701 | 9" SOLID BRICK RAILING 3'-8" HIGH | LF | 334.000 | 334.000 |
| 0401 0702 | 3'-8" HIGH - 2" DIA WELDED PIPE RAILING | LF | 334.000 | 334.000 |
| 0401 08 | EXTERIOR SOFFITS | SF | 2,357.000 | 2,357.000 |
| 0401 0801 | GYPSUM PLASTER EXTERIOR SOFFITS | SF | 2,357.000 | 2,357.000 |
| 0402 | EXTERIOR DOORS | EA | 14.000 | 14.000 |
| 0402 01 | GLAZED DOORS | EA | 12.000 | 12.000 |
| 0402 0104 | 6'-0" X 7'-0" ALUMINUM AND GLASS DOOR WITH TRANSOM | EA | 6.000 | 6.000 |
| 0402 02 | SOLID DOORS | EA | 2.000 | 2.000 |
| 0402 0201 | 3'0" X 7'0" HOLLOW METAL DOOR | EA | 2.000 | 2.000 |
| 0403 | EXTERIOR WINDOWS | SF | 1,047.000 | 1,047.000 |
| 0403 01 | WINDOWS | SF | 1,047.000 | 1,047.000 |
| 0403 0110 | ALUMINUM FRM SLIDING TYPE WINDOW - 3/8" BRONZE | SF | 1,047.000 | 1,047.000 |
| 05 | INTERIOR CONSTRUCTION | | | |
| | ADMIN MODULE - MEDIUM | | | |
| 0501 | PARTITIONS | SF | 936.000 | 936.000 |
| 0501 01 | FIXED PARTITIONS | SF | 936.000 | 936.000 |
| 0501 0101 | NON-LOAD BRG PARTITION - 16" O.C. | SF | 749.000 | 749.000 |
| 0501 0102 | NON-LOAD BRG PARTITION - 24" O.C. | SF | 187.000 | 187.000 |
| 0502 | INTERIOR DOORS | EA | 3.000 | 3.000 |
| 0502 01 | STANDARD INTERIOR DOORS | EA | 3.000 | 3.000 |
| 0502 0117 | 3'-0" X 7'-0" WOOD DOOR, HM FRM | EA | 3.000 | 3.000 |
| | BUILDING SUPPORT AREA | | | |
| 0501 | PARTITIONS | SF | 6,511.000 | 6,511.000 |
| 0501 01 | FIXED PARTITIONS | SF | 6,511.000 | 6,511.000 |
| 0501 0101 | NON-LOAD BRG PARTITION - 16" O.C. | SF | 326.000 | 326.000 |
| 0501 0102 | NON-LOAD BRG PARTITION - 24" O.C. | SF | 1,302.000 | 1,302.000 |
| 0501 0112 | NON-LOAD BRG PARTITION OF 8 X 6 X 16 CONCRETE | SF | 651.000 | 651.000 |

GENERIC NURSING HOME MODEL, INPUT PARAMETERS, PROJECT DEFINITION RUN

| | | UM | MODEL/ESTIMATED QUANTITY | USER QUANTITY | |
|---|---|---|---|---|---|
| 0501 0113 | NON-LOAD BRG PARTITION OF 8 X 8 X 16 CONCRETE | SF | 4,232.000 | 4,232.000 | |
| 0501 04 | INTERIOR BALUSTRADES & SCREENS | LF | 52.000 | 52.000 | |
| 0501 0401 | ALUMINUM BALCONY RAIL | LF | 52.000 | 52.000 | |
| 0502 | INTERIOR DOORS | EA | 30.000 | 30.000 | |
| 0502 01 | STANDARD INTERIOR DOORS | EA | 18.000 | 4.000 | * |
| 0502 0108 | 4'-0" X 7'-0" HOLLOW METAL DOOR | EA | 1.000 | 1.000 | |
| 0502 0111 | 8'-0" X 7'-0" PAIR HOLLOW METAL DOORS | EA | 1.000 | 1.000 | |
| 0502 0117 | 3'-0" X 7'-0" WOOD DOOR, HM FRM | EA | 2.000 | 2.000 | |
| 0502 0118 | 4'-0" X 7'-0" WOOD DOOR, HM FRM | EA | 1.000 | 1.000 | |
| 0502 0119 | 6'-0" X 7'-0" PAIR WOOD DOORS, HM FRM | EA | 1.000 | 1.000 | |
| 0502 02 | GLAZED INTERIOR DOORS | EA | 2.000 | 2.000 | |
| 0502 0204 | 6'-0" X 7'-0" ALUMINUM AND GLASS DOOR WITH TRANSOM | EA | 1.000 | 1.000 | |
| 0502 04 | FIRE DOORS | EA | 10.000 | 4.000 | * |
| 0502 0401 | 3'-0" X 7'-0" FIRE RATED HOLLOW METAL DOOR | EA | 1.000 | 1.000 | |
| 0502 0402 | 6'-0" X 7'-0" PAIR FIRE RATED HOLLOW METAL DOORS | EA | 1.000 | 1.000 | |
| 0502 0405 | 3'-0" X 7'-0" FIRE RATED WOOD DOOR | EA | 1.000 | 1.000 | |
| 0502 0406 | 6'-0" X 7'-0" PAIR FIRE RATED WOOD DOORS | EA | 1.000 | 1.000 | |
| 0503 | INTERIOR WINDOWS | SF | 266.000 | 266.000 | |
| 0503 01 | WINDOWS | SF | 125.000 | .000 | * |
| 0503 02 | STOREFRONTS | SF | 141.000 | 141.000 | |
| 0503 0201 | STOREFRONT WITH LT ALUMINUM FRM- 3/8" CLEAR GLASS | SF | 141.000 | 141.000 | |

DINING AREA; 40-250 PERSON

| | | | | |
|---|---|---|---|---|
| 0501 | PARTITIONS | SF | 2,581.000 | 2,581.000 |
| 0501 01 | FIXED PARTITIONS | SF | 3,096.000 | 3,096.000 |
| 0501 0101 | NON-LOAD BRG PARTITION - 16" O.C. | SF | 2,291.000 | 2,291.000 |
| 0501 0105 | MTL STUD PARTITION 4" - 1/2" GYP BD EACH SIDE | SF | 748.000 | 748.000 |
| 0501 0106 | MTL STUD PARTITION 4" - 1/2" GYP BD EA SIDE SOUND RATED | SF | 57.000 | 57.000 |
| 0502 | INTERIOR DOORS | EA | 3.000 | 3.000 |
| 0502 01 | STANDARD INTERIOR DOORS | EA | 2.000 | 2.000 |
| 0502 0104 | 3'0" X 7'0" HOLLOW METAL DOOR W/CLOSURE | EA | 2.000 | 2.000 |
| 0502 02 | GLAZED INTERIOR DOORS | EA | 1.000 | 1.000 |
| 0502 0204 | 6'-0" X 7'-0" ALUMINUM AND GLASS DOOR WITH TRANSOM | EA | 1.000 | 1.000 |
| 0503 | INTERIOR WINDOWS | SF | 100.000 | 100.000 |
| 0503 01 | WINDOWS | SF | 100.000 | 100.000 |
| 0503 0102 | FIXED TYPE WINDOW WITH ALUMINUM FRM - 1/4 CLEAR GLASS | SF | 100.000 | 100.000 |

LAUNDRY, STORAGE, AND MAID'S ROOM

| | | | | |
|---|---|---|---|---|
| 0501 | PARTITIONS | SF | 744.000 | 744.000 |

GENERIC NURSING HOME MODEL, INPUT PARAMETERS, PROJECT DEFINITION RUN

| | | UM | MODEL/ESTIMATED QUANTITY | USER QUANTITY |
|---|---|---|---|---|
| 0501 01 | FIXED PARTITIONS | SF | 708.000 | 708.000 |
| 0501 0102 | NON-LOAD BRG PARTITION - 24" O.C. | SF | 708.000 | 708.000 |
| 0502 | INTERIOR DOORS | EA | 1.000 | 1.000 |
| 0502 01 | STANDARD INTERIOR DOORS | EA | 1.000 | 1.000 |
| 0502 0117 | 3'-0" X 7'-0" WOOD DOOR, HM FRM | EA | 1.000 | 1.000 |
| | **LOUNGE AND GAME ROOM** | | | |
| 0501 | PARTITIONS | SF | 201.000 | 201.000 |
| 0501 01 | FIXED PARTITIONS | SF | 239.000 | 239.000 |
| 0501 0102 | NON-LOAD BRG PARTITION - 24" O.C. | SF | 239.000 | 239.000 |
| 0502 | INTERIOR DOORS | EA | 1.000 | 1.000 |
| 0502 01 | STANDARD INTERIOR DOORS | EA | 1.000 | 1.000 |
| 0502 0117 | 3'-0" X 7'-0" WOOD DOOR, HM FRM | EA | 1.000 | 1.000 |
| | **NURSING** | | | |
| 0501 | PARTITIONS | SF | 704.000 | 704.000 |
| 0501 01 | FIXED PARTITIONS | SF | 704.000 | 704.000 |
| 0501 0102 | NON-LOAD BRG PARTITION - 24" O.C. | SF | 704.000 | 704.000 |
| 0502 | INTERIOR DOORS | EA | 2.000 | 2.000 |
| 0502 01 | STANDARD INTERIOR DOORS | EA | 2.000 | 2.000 |
| 0502 0109 | 4'0" X 8'0" HOLLOW METAL DOOR | EA | 2.000 | 2.000 |
| | **OFFICE - CLOSED OFFICE SPACE** | | | |
| 0501 | PARTITIONS | SF | 580.000 | 580.000 |
| 0501 01 | FIXED PARTITIONS | SF | 580.000 | 580.000 |
| 0501 0101 | NON-LOAD BRG PARTITION - 16" O.C. | SF | 522.000 | 522.000 |
| 0501 0102 | NON-LOAD BRG PARTITION - 24" O.C. | SF | 58.000 | 58.000 |
| 0502 | INTERIOR DOORS | EA | 2.000 | 2.000 |
| 0502 01 | STANDARD INTERIOR DOORS | EA | 2.000 | 2.000 |
| 0502 0117 | 3'-0" X 7'-0" WOOD DOOR, HM FRM | EA | 2.000 | 2.000 |
| 0502 04 | FIRE DOORS | EA | 1.000 | 1.000 |
| 0502 0405 | 3'-0" X 7'-0" FIRE RATED WOOD DOOR | EA | 1.000 | 1.000 |
| 0502 0406 | 6'-0" X 7'-0" PAIR FIRE RATED WOOD DOORS | EA | 1.000 | 1.000 |
| 0503 | INTERIOR WINDOWS | SF | 3.000 | 3.000 |

GENERIC NURSING HOME MODEL, INPUT PARAMETERS, PROJECT DEFINITION RUN

| | | UM | MODEL/ESTIMATED QUANTITY | USER QUANTITY |
|---|---|---|---|---|
| 0503 01 | WINDOWS | SF | 3.000 | 3.000 |
| 0503 0104 | FIXED TYPE WINDOW WITH ALUMINUM FRM - 3/4" CLEAR GLASS | SF | 3.000 | 3.000 |
| | QUARTERS - ENLISTED (544 SF/UNIT) | | | |
| 0501 | PARTITIONS | SF | 20,182.000 | 20,182.000 |
| 0501 01 | FIXED PARTITIONS | SF | 19,221.000 | 19,221.000 |
| 0501 0102 | NON-LOAD BRG PARTITION - 24" O.C. | SF | 13,321.000 | 13,321.000 |
| 0501 0106 | MTL STUD PARTITION 4" - 1/2" GYP BD EA SIDE SOUND RATED | SF | 3,265.000 | 3,265.000 |
| 0501 0111 | NON-LOAD BRG PARTITION OF 8 X 4 X 16 CONCRETE | SF | 2,634.000 | 2,634.000 |
| 0502 | INTERIOR DOORS | EA | 86.000 | 86.000 |
| 0502 01 | STANDARD INTERIOR DOORS | EA | 86.000 | 86.000 |
| 0502 0101 | 3'-0" X 7'-0" HOLLOW METAL DOOR | EA | 22.000 | 22.000 |
| 0502 0117 | 3'-0" X 7'-0" WOOD DOOR, HM FRM | EA | 65.000 | 65.000 |
| | STORAGE - GENERAL PURPOSE | | | |
| 0501 | PARTITIONS | SF | 474.000 | 474.000 |
| 0501 01 | FIXED PARTITIONS | SF | 220.000 | 220.000 |
| 0501 0113 | NON-LOAD BRG PARTITION OF 8 X 8 X 16 CONCRETE | SF | 139.000 | 139.000 |
| 0501 0119 | 8 X 12 X 16 LOAD BRG REINFORCED CONC. MASONRY UNIT WALL | SF | 81.000 | 81.000 |
| 0502 | INTERIOR DOORS | EA | 3.000 | 3.000 |
| 0502 04 | FIRE DOORS | EA | 3.000 | 3.000 |
| 0502 0402 | 6'-0" X 7'-0" PAIR FIRE RATED HOLLOW METAL DOORS | EA | 2.000 | 2.000 |
| 0504 | INTERIOR OVERHEAD AND SPECIAL DOORS | SF | 18.000 | 18.000 |
| 0504 02 | SPECIAL DOORS | SF | 18.000 | 18.000 |
| 0504 0212 | 4 FT X 4 FT ALUMINUM ROLL UP GRILLE, MANUALLY OPERATED | EA | 1.000 | 1.000 |
| | FACILITY TOTAL | | | |
| 0501 | PARTITIONS | SF | 32,913.000 | 32,913.000 |
| 0501 01 | FIXED PARTITIONS | SF | 32,215.000 | 32,215.000 |
| 0501 0101 | NON-LOAD BRG PARTITION - 16" O.C. | SF | 3,888.000 | 3,888.000 |
| 0501 0102 | NON-LOAD BRG PARTITION - 24" O.C. | SF | 16,519.000 | 16,519.000 |
| 0501 0105 | MTL STUD PARTITION 4" - 1/2" GYP BD EACH SIDE | SF | 748.000 | 748.000 |
| 0501 0106 | MTL STUD PARTITION 4" - 1/2" GYP BD EA SIDE SOUND RATED | SF | 3,322.000 | 3,322.000 |
| 0501 0111 | NON-LOAD BRG PARTITION OF 8 X 4 X 16 CONCRETE | SF | 2,634.000 | 2,634.000 |
| 0501 0112 | NON-LOAD BRG PARTITION OF 8 X 6 X 16 CONCRETE | SF | 651.000 | 651.000 |

GENERIC NURSING HOME MODEL, INPUT PARAMETERS, PROJECT DEFINITION RUN

| | | UM | MODEL/ESTIMATED QUANTITY | USER QUANTITY |
|---|---|---|---|---|
| 0501 0113 | NON-LOAD BRG PARTITION OF 8 X 8 X 16 CONCRETE | SF | 4,371.000 | 4,371.000 |
| 0501 0119 | 8 X 12 X 16 LOAD BRG REINFORCED CONC. MASONRY UNIT WALL | SF | 81.000 | 81.000 |
| 0501 04 | INTERIOR BALUSTRADES & SCREENS | LF | 52.000 | 52.000 |
| 0501 0401 | ALUMINUM BALCONY RAIL | LF | 52.000 | 52.000 |
| 0502 | INTERIOR DOORS | EA | 131.000 | 131.000 |
| 0502 01 | STANDARD INTERIOR DOORS | EA | 115.000 | 101.000 * |
| 0502 0101 | 3'-0" X 7'-0" HOLLOW METAL DOOR | EA | 22.000 | 22.000 |
| 0502 0104 | 3'0" X 7'0" HOLLOW METAL DOOR W/CLOSURE | EA | 2.000 | 2.000 |
| 0502 0108 | 4'-0" X 7'-0" HOLLOW METAL DOOR | EA | 1.000 | 1.000 |
| 0502 0109 | 4'0" X 8'0" HOLLOW METAL DOOR | EA | 2.000 | 2.000 |
| 0502 0111 | 8'-0" X 7'-0" PAIR HOLLOW METAL DOORS | EA | 1.000 | 1.000 |
| 0502 0117 | 3'-0" X 7'-0" WOOD DOOR, HM FRM | EA | 74.000 | 74.000 |
| 0502 0118 | 4'-0" X 7'-0" WOOD DOOR, HM FRM | EA | 1.000 | 1.000 |
| 0502 0119 | 6'-0" X 7'-0" PAIR WOOD DOORS, HM FRM | EA | 1.000 | 1.000 |
| 0502 02 | GLAZED INTERIOR DOORS | EA | 3.000 | 3.000 |
| 0502 0204 | 6'-0" X 7'-0" ALUMINUM AND GLASS DOOR WITH TRANSOM | EA | 2.000 | 2.000 |
| 0502 04 | FIRE DOORS | EA | 14.000 | 8.000 * |
| 0502 0401 | 3'-0" X 7'-0" FIRE RATED HOLLOW METAL DOOR | EA | 1.000 | 1.000 |
| 0502 0402 | 6'-0" X 7'-0" PAIR FIRE RATED HOLLOW METAL DOORS | EA | 3.000 | 3.000 |
| 0502 0405 | 3'-0" X 7'-0" FIRE RATED WOOD DOOR | EA | 2.000 | 2.000 |
| 0502 0406 | 6'-0" X 7'-0" PAIR FIRE RATED WOOD DOORS | EA | 2.000 | 2.000 |
| 0503 | INTERIOR WINDOWS | SF | 369.000 | 369.000 |
| 0503 01 | WINDOWS | SF | 228.000 | 103.000 * |
| 0503 0102 | FIXED TYPE WINDOW WITH ALUMINUM FRM - 1/4 CLEAR GLASS | SF | 100.000 | 100.000 |
| 0503 0104 | FIXED TYPE WINDOW WITH ALUMINUM FRM - 3/4" CLEAR GLASS | SF | 3.000 | 3.000 |
| 0503 02 | STOREFRONTS | SF | 141.000 | 141.000 |
| 0503 0201 | STOREFRONT WITH LT ALUMINUM FRM- 3/8" CLEAR GLASS | SF | 141.000 | 141.000 |
| 0504 | INTERIOR OVERHEAD AND SPECIAL DOORS | SF | 18.000 | 18.000 |
| 0504 02 | SPECIAL DOORS | SF | 18.000 | 18.000 |
| 0504 0212 | 4 FT X 4 FT ALUMINUM ROLL UP GRILLE, MANUALLY OPERATED | EA | 1.000 | 1.000 |
| 06 | INTERIOR FINISHES | | | |

ADMIN MODULE - MEDIUM

| | | | | |
|---|---|---|---|---|
| 0601 | WALL FINISHES | SF | 1,789.000 | 1,789.000 |
| 0601 03 | GYPSUM WALLBOARD FINISHES | SF | 156.000 | 156.000 |
| 0601 0301 | 5/8" GYPSUM BOARD ON 7/8" FURRING CHANNEL | SF | 133.000 | 133.000 |
| 0601 0303 | TWO LAYERS OF 5/8" FIRE RESISTANT GYPSUM BOARD | SF | 23.000 | 23.000 |
| 0601 04 | TILE & TERRAZZO WALL FINISHES | SF | 53.000 | 53.000 |

* THIS VALUE WAS INPUT BY THE USER.

GENERIC NURSING HOME MODEL, INPUT PARAMETERS, PROJECT DEFINITION RUN

| | | UM | MODEL/ESTIMATED QUANTITY | USER QUANTITY |
|---|---|---|---|---|
| 0601 0401 | 4-1/4" X 4-1/4" CERAMIC TILE TO WALLS | SF | 53.000 | 53.000 |
| 0601 05 | PAINTING TO WALL | SF | 1,025.000 | 1,025.000 |
| 0601 0501 | PAINT TO GYPSUM BOARD WALLS USING ROLLER | SF | 820.000 | 820.000 |
| 0601 0502 | PAINT TO CONCRETE BLOCK USING BRUSHES, TWO COATS | SF | 205.000 | 205.000 |
| 0601 06 | WALL COVERINGS | SF | 555.000 | 555.000 |
| 0601 0602 | MEDIUM WEIGHT VINYL WALLCOVERING WITH FABRIC BACKING | SF | 555.000 | 555.000 |
| 0602 | FLOORING & FLOOR FINISHES | SF | 720.000 | 720.000 |
| 0602 01 | TILE FLOOR FINISHES | SF | 28.000 | 28.000 |
| 0602 0101 | THIN SET NATURAL CLAY CERAMIC TILE FLOOR AND BASE | SF | 28.000 | 28.000 |
| 0602 05 | CARPETING | SF | 649.000 | 649.000 |
| 0602 0501 | COMMERCIAL GRADE 26 OZ. NYLON CARPET | SF | 389.000 | 389.000 |
| 0602 0503 | COMMERCIAL GRADE 30 OZ. WOOL CARPET | SF | 260.000 | 260.000 |
| 0602 07 | SPECIAL FLOORING | SF | 43.000 | 43.000 |
| 0602 0701 | VINYL PEDESTAL ACCESS FLR W/HANDRAIL | SF | 43.000 | 43.000 |
| 0603 | CEILING & CEILING FINISHES | SF | 720.000 | 720.000 |
| 0603 03 | GYPSUM WALLBOARD CEILING FINISHES | SF | 16.000 | 16.000 |
| 0603 0302 | 5/8" GYPSUM WALLBOARD CEILING, 3 LAYERS, OVER 8 FT. | SF | 16.000 | 16.000 |
| 0603 04 | ACOUSTIC CEILING TILES & PANELS | SF | 704.000 | 704.000 |
| 0603 0402 | 2' X 2' OR 2' X 4' FIBERGLASS ACOUSTICAL CEILING TILES | SF | 704.000 | 704.000 |
| 0603 06 | PAINTING & STAINING CEILINGS | SF | 16.000 | 16.000 |
| 0603 0601 | PAINTING TO DRYWALL OR PLASTER USING ROLLERS, 2 COATS | SF | 16.000 | 16.000 |
| 0603 07 | SUSPENSION SYSTEMS | SF | 720.000 | 720.000 |
| 0603 0702 | T-BAR CEILING SUSPENSION SYSTEM 2' X 2' GRID | SF | 704.000 | 704.000 |
| 0603 0704 | SUSPENSION SYSTEM FOR GYPSUM BOARD CEILING | SF | 16.000 | 16.000 |
| | BUILDING SUPPORT AREA | | | |
| 0601 | WALL FINISHES | SF | 7,605.000 | 7,605.000 |
| 0601 02 | PLASTER WALL FINISHES | SF | 3,539.000 | 3,539.000 |
| 0601 0201 | 2 COATS OF GYPSUM PLASTER ON 3/8" GYPSUM LATH | SF | 3,539.000 | 3,539.000 |
| 0601 03 | GYPSUM WALLBOARD FINISHES | SF | 929.000 | 929.000 |
| 0601 0301 | 5/8" GYPSUM BOARD ON 7/8" FURRING CHANNEL | SF | 780.000 | 780.000 |
| 0601 0303 | TWO LAYERS OF 5/8" FIRE RESISTANT GYPSUM BOARD | SF | 149.000 | 149.000 |
| 0601 04 | TILE & TERRAZZO WALL FINISHES | SF | 1,819.000 | .000 * |
| 0601 05 | PAINTING TO WALL | SF | 4,386.000 | 6,205.000 * |
| 0601 0501 | PAINT TO GYPSUM BOARD WALLS USING ROLLER | SF | 1,551.000 | 1,551.000 |
| 0601 0502 | PAINT TO CONCRETE BLOCK USING BRUSHES, TWO COATS | SF | 4,654.000 | 4,654.000 |
| 0601 06 | WALL COVERINGS | SF | 1,638.000 | 1,638.000 |
| 0601 0602 | MEDIUM WEIGHT VINYL WALLCOVERING WITH FABRIC BACKING | SF | 1,638.000 | 1,638.000 |
| 0602 | FLOORING & FLOOR FINISHES | SF | 5,850.000 | 5,850.000 |

* THIS VALUE WAS INPUT BY THE USER.

GENERIC NURSING HOME MODEL, INPUT PARAMETERS, PROJECT DEFINITION RUN

| | | UM | MODEL/ESTIMATED QUANTITY | USER QUANTITY |
|---|---|---|---|---|
| 0602 01 | TILE FLOOR FINISHES | SF | 914.000 | 914.000 |
| 0602 0101 | THIN SET NATURAL CLAY CERAMIC TILE FLOOR AND BASE | SF | 914.000 | 914.000 |
| 0602 04 | RESILIENT FLOORING | SF | 457.000 | 2,892.000 * |
| 0602 0401 | VINYL TILE, 1/8 "X 12" X 12" | SF | 2,892.000 | 2,892.000 |
| 0602 05 | CARPETING | SF | 2,435.000 | .000 * |
| 0602 06 | MASONRY & STONE FLOORING | SF | 817.000 | 817.000 |
| 0602 0601 | FLOOR PAVERS 8X4, 1" TO 1-1/4" THICK | SF | 817.000 | 817.000 |
| 0603 | CEILING & CEILING FINISHES | SF | 5,850.000 | 5,850.000 |
| 0603 03 | GYPSUM WALLBOARD CEILING FINISHES | SF | 1,579.000 | 1,579.000 |
| 0603 0302 | 5/8" GYPSUM WALLBOARD CEILING, 3 LAYERS, OVER 8 FT. | SF | 1,579.000 | 1,579.000 |
| 0603 04 | ACOUSTIC CEILING TILES & PANELS | SF | 3,424.000 | 3,424.000 |
| 0603 0402 | 2' X 2' OR 2' X 4' FIBERGLASS ACOUSTICAL CEILING TILES | SF | 3,424.000 | 3,424.000 |
| 0603 06 | PAINTING & STAINING CEILINGS | SF | 1,579.000 | 1,579.000 |
| 0603 0601 | PAINTING TO DRYWALL OR PLASTER USING ROLLERS, 2 COATS | SF | 1,579.000 | 1,579.000 |
| 0603 07 | SUSPENSION SYSTEMS | SF | 5,002.000 | 5,002.000 |
| 0603 0703 | T-BAR CEILING SUSPENSION SYSTEM 2' X 4' GRID | SF | 3,434.000 | 3,434.000 |
| 0603 0704 | SUSPENSION SYSTEM FOR GYPSUM BOARD CEILING | SF | 1,568.000 | 1,568.000 |
| | DINING AREA; 40-250 PERSON | | | |
| 0601 | WALL FINISHES | SF | 2,952.000 | 2,952.000 |
| 0601 02 | PLASTER WALL FINISHES | SF | 551.000 | 551.000 |
| 0601 0201 | 2 COATS OF GYPSUM PLASTER ON 3/8" GYPSUM LATH | SF | 551.000 | 551.000 |
| 0601 04 | TILE & TERRAZZO WALL FINISHES | SF | 551.000 | 551.000 |
| 0601 0401 | 4-1/4" X 4-1/4" CERAMIC TILE TO WALLS | SF | 551.000 | 551.000 |
| 0601 06 | WALL COVERINGS | SF | 2,561.000 | 2,561.000 |
| 0601 0602 | MEDIUM WEIGHT VINYL WALLCOVERING WITH FABRIC BACKING | SF | 2,561.000 | 2,561.000 |
| 0602 | FLOORING & FLOOR FINISHES | SF | 3,200.000 | 3,200.000 |
| 0602 01 | TILE FLOOR FINISHES | SF | 329.000 | 329.000 |
| 0602 0102 | 6" X 6" X 1/2" MUD SET QUARRY TILE AND BASE | SF | 329.000 | 329.000 |
| 0602 05 | CARPETING | SF | 2,871.000 | 2,871.000 |
| 0602 0502 | COMMERCIAL GRADE 35 OZ NYLON | SF | 2,871.000 | 2,871.000 |
| 0603 | CEILING & CEILING FINISHES | SF | 3,200.000 | 3,200.000 |
| 0603 04 | ACOUSTIC CEILING TILES & PANELS | SF | 3,200.000 | 3,200.000 |
| 0603 0402 | 2' X 2' OR 2' X 4' FIBERGLASS ACOUSTICAL CEILING TILES | SF | 3,200.000 | 3,200.000 |
| 0603 07 | SUSPENSION SYSTEMS | SF | 3,200.000 | 3,200.000 |
| 0603 0702 | T-BAR CEILING SUSPENSION SYSTEM 2' X 2' GRID | SF | 3,200.000 | 3,200.000 |
| | LAUNDRY, STORAGE, AND MAID'S ROOM | | | |
| 0601 | WALL FINISHES | SF | 2,969.000 | 2,969.000 |

* THIS VALUE WAS INPUT BY THE USER.

GENERIC NURSING HOME MODEL, INPUT PARAMETERS, PROJECT DEFINITION RUN

| | | UM | MODEL/ESTIMATED QUANTITY | USER QUANTITY |
|---|---|---|---|---|
| 0601 05 | PAINTING TO WALL | SF | 2,969.000 | 2,969.000 |
| 0601 0506 | EPOXY PAINT TO DRYWALL | SF | 2,969.000 | 2,969.000 |
| 0602 | FLOORING & FLOOR FINISHES | SF | 1,200.000 | 1,200.000 |
| 0602 01 | TILE FLOOR FINISHES | SF | 1,200.000 | 1,200.000 |
| 0602 0101 | THIN SET NATURAL CLAY CERAMIC TILE FLOOR AND BASE | SF | 1,200.000 | 1,200.000 |
| 0603 | CEILING & CEILING FINISHES | SF | 1,200.000 | 1,200.000 |
| 0603 01 | EXPOSED CONCRETE FINISHES | SF | 600.000 | 600.000 |
| 0603 0101 | EXPOSED CONCRETE FINISH | SF | 600.000 | 600.000 |
| 0603 03 | GYPSUM WALLBOARD CEILING FINISHES | SF | 600.000 | 600.000 |
| 0603 0301 | 5/8" GYPSUM WALL BOARD CEILING, 1 LAYER, FIRE RATED | SF | 600.000 | 600.000 |

LOUNGE AND GAME ROOM

| | | UM | MODEL/ESTIMATED QUANTITY | USER QUANTITY |
|---|---|---|---|---|
| 0601 | WALL FINISHES | SF | 1,122.000 | 1,122.000 |
| 0601 06 | WALL COVERINGS | SF | 381.000 | 381.000 |
| 0601 0602 | MEDIUM WEIGHT VINYL WALLCOVERING WITH FABRIC BACKING | SF | 381.000 | 381.000 |
| 0602 | FLOORING & FLOOR FINISHES | SF | 600.000 | 600.000 |
| 0602 04 | RESILIENT FLOORING | SF | 300.000 | 300.000 |
| 0602 0401 | VINYL TILE, 1/8 "X 12" X 12" | SF | 300.000 | 300.000 |
| 0602 05 | CARPETING | SF | 300.000 | 300.000 |
| 0602 0501 | COMMERCIAL GRADE 26 OZ. NYLON CARPET | SF | 300.000 | 300.000 |
| 0603 | CEILING & CEILING FINISHES | SF | 600.000 | 600.000 |
| 0603 01 | EXPOSED CONCRETE FINISHES | SF | 300.000 | 300.000 |
| 0603 0101 | EXPOSED CONCRETE FINISH | SF | 300.000 | 300.000 |
| 0603 03 | GYPSUM WALLBOARD CEILING FINISHES | SF | 300.000 | 300.000 |
| 0603 0301 | 5/8" GYPSUM WALL BOARD CEILING, 1 LAYER, FIRE RATED | SF | 300.000 | 300.000 |

NURSING

| | | UM | MODEL/ESTIMATED QUANTITY | USER QUANTITY |
|---|---|---|---|---|
| 0601 | WALL FINISHES | SF | 1,362.000 | 1,362.000 |
| 0601 02 | PLASTER WALL FINISHES | SF | 227.000 | 227.000 |
| 0601 0201 | 2 COATS OF GYPSUM PLASTER ON 3/8" GYPSUM LATH | SF | 227.000 | 227.000 |
| 0601 03 | GYPSUM WALLBOARD FINISHES | SF | 138.000 | 138.000 |
| 0601 0301 | 5/8" GYPSUM BOARD ON 7/8" FURRING CHANNEL | SF | 117.000 | 117.000 |
| 0601 0303 | TWO LAYERS OF 5/8" FIRE RESISTANT GYPSUM BOARD | SF | 21.000 | 21.000 |
| 0601 04 | TILE & TERRAZZO WALL FINISHES | SF | 108.000 | 108.000 |
| 0601 0401 | 4-1/4" X 4-1/4" CERAMIC TILE TO WALLS | SF | 108.000 | 108.000 |
| 0601 05 | PAINTING TO WALL | SF | 596.000 | 596.000 |

GENERIC NURSING HOME MODEL, INPUT PARAMETERS, PROJECT DEFINITION RUN

| | | UM | MODEL/ESTIMATED QUANTITY | USER QUANTITY |
|---|---|---|---|---|
| 0601 0501 | PAINT TO GYPSUM BOARD WALLS USING ROLLER | SF | 596.000 | 596.000 |
| 0601 06 | WALL COVERINGS | SF | 293.000 | 293.000 |
| 0601 0602 | MEDIUM WEIGHT VINYL WALLCOVERING WITH FABRIC BACKING | SF | 293.000 | 293.000 |
| 0601 08 | SPECIAL COATINGS AND WALL COVERINGS TO WALLS | SF | 31.000 | 31.000 |
| 0601 0804 | MATT FINISH LIQUID GLAZED WALL COATING | SF | 31.000 | 31.000 |
| 0602 | FLOORING & FLOOR FINISHES | SF | 400.000 | 400.000 |
| 0602 04 | RESILIENT FLOORING | SF | 158.000 | 158.000 |
| 0602 0402 | VINYL TILE 1/8" TRAVERTINE | SF | 158.000 | 158.000 |
| 0602 05 | CARPETING | SF | 242.000 | 242.000 |
| 0602 0503 | COMMERCIAL GRADE 30 OZ. WOOL CARPET | SF | 242.000 | 242.000 |
| 0603 | CEILING & CEILING FINISHES | SF | 400.000 | 400.000 |
| 0603 03 | GYPSUM WALLBOARD CEILING FINISHES | SF | 73.000 | 73.000 |
| 0603 0302 | 5/8" GYPSUM WALLBOARD CEILING, 3 LAYERS, OVER 8 FT. | SF | 73.000 | 73.000 |
| 0603 04 | ACOUSTIC CEILING TILES & PANELS | SF | 327.000 | 327.000 |
| 0603 0402 | 2' X 2' OR 2' X 4' FIBERGLASS ACOUSTICAL CEILING TILES | SF | 327.000 | 327.000 |
| 0603 06 | PAINTING & STAINING CEILINGS | SF | 73.000 | 73.000 |
| 0603 0601 | PAINTING TO DRYWALL OR PLASTER USING ROLLERS, 2 COATS | SF | 73.000 | 73.000 |
| 0603 07 | SUSPENSION SYSTEMS | SF | 400.000 | 400.000 |
| 0603 0702 | T-BAR CEILING SUSPENSION SYSTEM 2' X 2' GRID | SF | 327.000 | 327.000 |
| 0603 0704 | SUSPENSION SYSTEM FOR GYPSUM BOARD CEILING | SF | 73.000 | 73.000 |

OFFICE - CLOSED OFFICE SPACE

| | | | | |
|---|---|---|---|---|
| 0601 | WALL FINISHES | SF | 1,503.000 | 1,503.000 |
| 0601 03 | GYPSUM WALLBOARD FINISHES | SF | 85.000 | 85.000 |
| 0601 0301 | 5/8" GYPSUM BOARD ON 7/8" FURRING CHANNEL | SF | 71.000 | 71.000 |
| 0601 0303 | TWO LAYERS OF 5/8" FIRE RESISTANT GYPSUM BOARD | SF | 14.000 | 14.000 |
| 0601 05 | PAINTING TO WALL | SF | 1,465.000 | 1,465.000 |
| 0601 0501 | PAINT TO GYPSUM BOARD WALLS USING ROLLER | SF | 1,465.000 | 1,465.000 |
| 0601 06 | WALL COVERINGS | SF | 79.000 | 79.000 |
| 0601 0601 | LIGHT WEIGHT VINYL WALLCOVERING WITH FABRIC BACKING | SF | 79.000 | 79.000 |
| 0601 07 | ACOUSTICAL TILES & PANELS TO WALLS | SF | 15.000 | 15.000 |
| 0601 0701 | 4' X 8' X 1" FIBERGLASS SOUND ABSORBING PANELS | SF | 15.000 | 15.000 |
| 0602 | FLOORING & FLOOR FINISHES | SF | 544.000 | 544.000 |
| 0602 04 | RESILIENT FLOORING | SF | 53.000 | 53.000 |
| 0602 0401 | VINYL TILE, 1/8 "X 12" X 12" | SF | 53.000 | 53.000 |
| 0602 05 | CARPETING | SF | 491.000 | 491.000 |
| 0602 0501 | COMMERCIAL GRADE 26 OZ. NYLON CARPET | SF | 491.000 | 491.000 |
| 0603 | CEILING & CEILING FINISHES | SF | 544.000 | 544.000 |

GENERIC NURSING HOME MODEL, INPUT PARAMETERS, PROJECT DEFINITION RUN

| | | UM | MODEL/ESTIMATED QUANTITY | USER QUANTITY |
|---|---|---|---|---|
| 0603 04 | ACOUSTIC CEILING TILES & PANELS | SF | 544.000 | 544.000 |
| 0603 0402 | 2' X 2' OR 2' X 4' FIBERGLASS ACOUSTICAL CEILING TILES | SF | 544.000 | 544.000 |
| 0603 07 | SUSPENSION SYSTEMS | SF | 544.000 | 544.000 |
| 0603 0703 | T-BAR CEILING SUSPENSION SYSTEM 2' X 4' GRID | SF | 544.000 | 544.000 |
| 0603 0704 | SUSPENSION SYSTEM FOR GYPSUM BOARD CEILING | SF | 13.000 | 13.000 |
| | QUARTERS - ENLISTED (544 SF/UNIT) | | | |
| 0601 | WALL FINISHES | SF | 36,803.000 | 36,803.000 |
| 0601 03 | GYPSUM WALLBOARD FINISHES | SF | 10,707.000 | 10,707.000 |
| 0601 0301 | 5/8" GYPSUM BOARD ON 7/8" FURRING CHANNEL | SF | 10,707.000 | 10,707.000 |
| 0601 04 | TILE & TERRAZZO WALL FINISHES | SF | 3,547.000 | 3,547.000 |
| 0601 0401 | 4-1/4" X 4-1/4" CERAMIC TILE TO WALLS | SF | 3,547.000 | 3,547.000 |
| 0601 05 | PAINTING TO WALL | SF | 10,707.000 | 10,707.000 |
| 0601 0501 | PAINT TO GYPSUM BOARD WALLS USING ROLLER | SF | 10,707.000 | 10,707.000 |
| 0601 06 | WALL COVERINGS | SF | 1,438.000 | 1,438.000 |
| 0601 0602 | MEDIUM WEIGHT VINYL WALLCOVERING WITH FABRIC BACKING | SF | 1,438.000 | 1,438.000 |
| 0602 | FLOORING & FLOOR FINISHES | SF | 7,760.000 | 7,760.000 |
| 0602 01 | TILE FLOOR FINISHES | SF | 1,109.000 | 1,109.000 |
| 0602 0101 | THIN SET NATURAL CLAY CERAMIC TILE FLOOR AND BASE | SF | 1,109.000 | 1,109.000 |
| 0602 04 | RESILIENT FLOORING | SF | .000 | 4,788.000 * |
| 0602 05 | CARPETING | SF | 4,788.000 | .000 * |
| 0603 | CEILING & CEILING FINISHES | SF | 7,760.000 | 7,760.000 |
| 0603 01 | EXPOSED CONCRETE FINISHES | SF | 4,669.000 | 4,669.000 |
| 0603 0101 | EXPOSED CONCRETE FINISH | SF | 4,669.000 | 4,669.000 |
| 0603 03 | GYPSUM WALLBOARD CEILING FINISHES | SF | 3,091.000 | 3,091.000 |
| 0603 0301 | 5/8" GYPSUM WALL BOARD CEILING, 1 LAYER, FIRE RATED | SF | 3,091.000 | 3,091.000 |
| 0603 07 | SUSPENSION SYSTEMS | SF | 3,091.000 | 3,091.000 |
| 0603 0704 | SUSPENSION SYSTEM FOR GYPSUM BOARD CEILING | SF | 3,091.000 | 3,091.000 |
| | STORAGE - GENERAL PURPOSE | | | |
| 0601 | WALL FINISHES | SF | 1,054.000 | 1,054.000 |
| 0601 03 | GYPSUM WALLBOARD FINISHES | SF | 165.000 | 165.000 |
| 0601 0301 | 5/8" GYPSUM BOARD ON 7/8" FURRING CHANNEL | SF | 165.000 | 165.000 |
| 0601 05 | PAINTING TO WALL | SF | 331.000 | 331.000 |
| 0601 0502 | PAINT TO CONCRETE BLOCK USING BRUSHES, TWO COATS | SF | 331.000 | 331.000 |
| 0602 | FLOORING & FLOOR FINISHES | SF | 400.000 | 400.000 |
| 0602 09 | OTHER FLOOR FINISHES | SF | 400.000 | 400.000 |

* THIS VALUE WAS INPUT BY THE USER.

GENERIC NURSING HOME MODEL, INPUT PARAMETERS, PROJECT DEFINITION RUN

| | | UM | MODEL/ESTIMATED QUANTITY | USER QUANTITY |
|---|---|---|---|---|
| 0602 0903 | FLOOR HARDENER, NON-METALLIC LIGHT SERVICE | SF | 400.000 | 400.000 |
| 0603 | CEILING & CEILING FINISHES | SF | 400.000 | 400.000 |
| 0603 06 | PAINTING & STAINING CEILINGS | SF | 400.000 | 400.000 |
| 0603 0603 | PAINT EXPOSED STEEL JOISTS AND ROOF DECK | SF | 400.000 | 400.000 |
| | FACILITY TOTAL | | | |
| 0601 | WALL FINISHES | SF | 57,159.000 | 57,159.000 |
| 0601 02 | PLASTER WALL FINISHES | SF | 4,317.000 | 4,317.000 |
| 0601 0201 | 2 COATS OF GYPSUM PLASTER ON 3/8" GYPSUM LATH | SF | 4,317.000 | 4,317.000 |
| 0601 03 | GYPSUM WALLBOARD FINISHES | SF | 12,180.000 | 12,180.000 |
| 0601 0301 | 5/8" GYPSUM BOARD ON 7/8" FURRING CHANNEL | SF | 11,973.000 | 11,973.000 |
| 0601 0303 | TWO LAYERS OF 5/8" FIRE RESISTANT GYPSUM BOARD | SF | 207.000 | 207.000 |
| 0601 04 | TILE & TERRAZZO WALL FINISHES | SF | 6,078.000 | 4,259.000 * |
| 0601 0401 | 4-1/4" X 4-1/4" CERAMIC TILE TO WALLS | SF | 4,259.000 | 4,259.000 |
| 0601 05 | PAINTING TO WALL | SF | 21,479.000 | 23,298.000 * |
| 0601 0501 | PAINT TO GYPSUM BOARD WALLS USING ROLLER | SF | 15,139.000 | 15,139.000 |
| 0601 0502 | PAINT TO CONCRETE BLOCK USING BRUSHES, TWO COATS | SF | 5,190.000 | 5,190.000 |
| 0601 0506 | EPOXY PAINT TO DRYWALL | SF | 2,969.000 | 2,969.000 |
| 0601 06 | WALL COVERINGS | SF | 6,945.000 | 6,945.000 |
| 0601 0601 | LIGHT WEIGHT VINYL WALLCOVERING WITH FABRIC BACKING | SF | 79.000 | 79.000 |
| 0601 0602 | MEDIUM WEIGHT VINYL WALLCOVERING WITH FABRIC BACKING | SF | 6,866.000 | 6,866.000 |
| 0601 07 | ACOUSTICAL TILES & PANELS TO WALLS | SF | 15.000 | 15.000 |
| 0601 0701 | 4' X 8' X 1" FIBERGLASS SOUND ABSORBING PANELS | SF | 15.000 | 15.000 |
| 0601 08 | SPECIAL COATINGS AND WALL COVERINGS TO WALLS | SF | 31.000 | 31.000 |
| 0601 0804 | MATT FINISH LIQUID GLAZED WALL COATING | SF | 31.000 | 31.000 |
| 0602 | FLOORING & FLOOR FINISHES | SF | 21,058.000 | 21,058.000 |
| 0602 01 | TILE FLOOR FINISHES | SF | 3,580.000 | 3,580.000 |
| 0602 0101 | THIN SET NATURAL CLAY CERAMIC TILE FLOOR AND BASE | SF | 3,251.000 | 3,251.000 |
| 0602 0102 | 6" X 6" X 1/2" MUD SET QUARRY TILE AND BASE | SF | 329.000 | 329.000 |
| 0602 04 | RESILIENT FLOORING | SF | 968.000 | 8,191.000 * |
| 0602 0401 | VINYL TILE, 1/8 "X 12" X 12" | SF | 3,245.000 | 3,245.000 |
| 0602 0402 | VINYL TILE 1/8" TRAVERTINE | SF | 158.000 | 158.000 |
| 0602 05 | CARPETING | SF | 11,776.000 | 4,553.000 * |
| 0602 0501 | COMMERCIAL GRADE 26 OZ. NYLON CARPET | SF | 1,180.000 | 1,180.000 |
| 0602 0502 | COMMERCIAL GRADE 35 OZ NYLON | SF | 2,871.000 | 2,871.000 |
| 0602 0503 | COMMERCIAL GRADE 30 OZ. WOOL CARPET | SF | 502.000 | 502.000 |
| 0602 06 | MASONRY & STONE FLOORING | SF | 817.000 | 817.000 |
| 0602 0601 | FLOOR PAVERS 8X4, 1" TO 1-1/4" THICK | SF | 817.000 | 817.000 |
| 0602 07 | SPECIAL FLOORING | SF | 43.000 | 43.000 |
| 0602 0701 | VINYL PEDESTAL ACCESS FLR W/HANDRAIL | SF | 43.000 | 43.000 |

* THIS VALUE WAS INPUT BY THE USER.

GENERIC NURSING HOME MODEL, INPUT PARAMETERS, PROJECT DEFINITION RUN

| | | UM | MODEL/ESTIMATED QUANTITY | USER QUANTITY |
|---|---|---|---|---|
| 0602 09 | OTHER FLOOR FINISHES | SF | 400.000 | 400.000 |
| 0602 0903 | FLOOR HARDENER, NON-METALLIC LIGHT SERVICE | SF | 400.000 | 400.000 |
| 0603 | CEILING & CEILING FINISHES | SF | 21,058.000 | 21,058.000 |
| 0603 01 | EXPOSED CONCRETE FINISHES | SF | 5,569.000 | 5,569.000 |
| 0603 0101 | EXPOSED CONCRETE FINISH | SF | 5,569.000 | 5,569.000 |
| 0603 03 | GYPSUM WALLBOARD CEILING FINISHES | SF | 5,659.000 | 5,659.000 |
| 0603 0301 | 5/8" GYPSUM WALL BOARD CEILING, 1 LAYER, FIRE RATED | SF | 3,991.000 | 3,991.000 |
| 0603 0302 | 5/8" GYPSUM WALLBOARD CEILING, 3 LAYERS, OVER 8 FT. | SF | 1,668.000 | 1,668.000 |
| 0603 04 | ACOUSTIC CEILING TILES & PANELS | SF | 8,199.000 | 8,199.000 |
| 0603 0402 | 2' X 2' OR 2' X 4' FIBERGLASS ACOUSTICAL CEILING TILES | SF | 8,199.000 | 8,199.000 |
| 0603 06 | PAINTING & STAINING CEILINGS | SF | 2,068.000 | 2,068.000 |
| 0603 0601 | PAINTING TO DRYWALL OR PLASTER USING ROLLERS, 2 COATS | SF | 1,668.000 | 1,668.000 |
| 0603 0603 | PAINT EXPOSED STEEL JOISTS AND ROOF DECK | SF | 400.000 | 400.000 |
| 0603 07 | SUSPENSION SYSTEMS | SF | 12,957.000 | 12,957.000 |
| 0603 0702 | T-BAR CEILING SUSPENSION SYSTEM 2' X 2' GRID | SF | 4,231.000 | 4,231.000 |
| 0603 0703 | T-BAR CEILING SUSPENSION SYSTEM 2' X 4' GRID | SF | 3,978.000 | 3,978.000 |
| 0603 0704 | SUSPENSION SYSTEM FOR GYPSUM BOARD CEILING | SF | 4,761.000 | 4,761.000 |
| 0603 09 | SPECIAL CEILINGS | SF | 384.000 | 384.000 |
| 0603 0902 | EXTERIOR CANOPY W/FRAMING | SF | 384.000 | 384.000 |
| 07 | SPECIALTIES | | | |
| | ADMIN MODULE - MEDIUM | | | |
| 0701 | GENERAL SPECIALTIES | SF | 720.000 | 720.000 |
| 0701 01 | COMPARTMENTS, CUBICLES, AND TOILET PARTITIONS | EA | 1.000 | 1.000 |
| 0701 0101 | URINAL SCREENS | EA | 1.000 | 1.000 |
| 0701 0102 | TOILET PARTITION AND ACCESSORIES | EA | 1.000 | 1.000 |
| 0701 0106 | LAVORATORY ACCESSORIES | EA | 1.000 | 1.000 |
| 0702 | BUILT-IN SPECIALTIES | SF | 720.000 | 720.000 |
| 0702 02 | CABINETS | LF | 1.000 | 1.000 |
| 0702 0210 | METAL BASE AND WALL CABINETS | LF | 1.000 | 1.000 |
| | BUILDING SUPPORT AREA | | | |
| 0701 | GENERAL SPECIALTIES | SF | 5,850.000 | 5,850.000 |
| 0701 01 | COMPARTMENTS, CUBICLES, AND TOILET PARTITIONS | EA | 25.000 | .000 * |
| 0701 02 | TOILET & BATH ACCESSORIES | EA | 3.000 | .000 * |
| 0701 03 | CHALK & TACKBOARDS | SF | 35.000 | .000 * |
| 0701 04 | IDENTIFYING DEVICES | EA | 40.000 | 40.000 |

* THIS VALUE WAS INPUT BY THE USER.

GENERIC NURSING HOME MODEL, INPUT PARAMETERS, PROJECT DEFINITION RUN

| | | UM | MODEL/ESTIMATED QUANTITY | USER QUANTITY |
|---|---|---|---|---|
| 0701 0403 | BRONZE LETTERS WITH SATIN FINISH 8" HIGH | EA | 4.000 | 4.000 |
| 0701 0406 | ALUMINUM FRAMED GLASS COVERED DIRECTORY BOARD | EA | 3.000 | 3.000 |
| 0701 06 | SHELVING | LF | 58.000 | .000 * |
| 0702 | BUILT-IN SPECIALTIES | SF | 5,850.000 | 5,850.000 |
| | COVERED EXTERIOR ENTRYWAY | | | |
| 0701 | GENERAL SPECIALTIES | SF | 384.000 | 384.000 |
| 0702 | BUILT-IN SPECIALTIES | SF | 384.000 | 384.000 |
| | DINING AREA; 40-250 PERSON | | | |
| 0701 | GENERAL SPECIALTIES | SF | 3,200.000 | 3,200.000 |
| 0701 01 | COMPARTMENTS, CUBICLES, AND TOILET PARTITIONS | EA | 1.000 | 1.000 |
| 0701 0103 | TOILET PARTITIONS - PORCELAIN ENAMELED STEEL, WALL HUNG | EA | 1.000 | 1.000 |
| 0701 02 | TOILET & BATH ACCESSORIES | EA | 7.000 | 7.000 |
| 0701 0201 | TOILET PAPER HOLDER | EA | 1.000 | 1.000 |
| 0701 0202 | SANITARY NAPKIN DISPENSER | EA | 1.000 | 1.000 |
| 0701 0203 | PAPER TOWEL DISPENSER AND WASTE RECEPTACLE | EA | 1.000 | 1.000 |
| 0701 0206 | GRAB BARS | EA | 1.000 | 1.000 |
| 0701 0207 | BATH ROOM MIRRORS | EA | 2.000 | 2.000 |
| 0701 0209 | SANITARY NAPKIN AND TAMPON RECEPTACLE | EA | 1.000 | 1.000 |
| 0701 0210 | SOAP DISPENSER | EA | 2.000 | 2.000 |
| 0702 | BUILT-IN SPECIALTIES | SF | 3,200.000 | 3,200.000 |
| | LAUNDRY, STORAGE, AND MAID'S ROOM | | | |
| 0701 | GENERAL SPECIALTIES | SF | 1,200.000 | 1,200.000 |
| 0701 01 | COMPARTMENTS, CUBICLES, AND TOILET PARTITIONS | EA | 1.000 | 1.000 |
| 0701 0102 | TOILET PARTITION AND ACCESSORIES | EA | 1.000 | 1.000 |
| 0701 06 | SHELVING | LF | 316.000 | 316.000 |
| 0701 0601 | 10" WIDE STOCK PREFINISHED SHELVES WITH SUPPORTS | LF | 316.000 | 316.000 |
| 0702 | BUILT-IN SPECIALTIES | SF | 1,200.000 | 1,200.000 |
| 0702 01 | COUNTERS | LF | 23.000 | 23.000 |
| 0702 0101 | PLASTIC LAMINATE COUNTERTOP WITH BACKSPLASH | LF | 23.000 | 23.000 |
| | LOUNGE AND GAME ROOM | | | |
| 0701 | GENERAL SPECIALTIES | SF | 600.000 | 600.000 |

GENERIC NURSING HOME MODEL, INPUT PARAMETERS, PROJECT DEFINITION RUN

| | | UM | MODEL/ESTIMATED QUANTITY | USER QUANTITY |
|---|---|---|---|---|
| 0701 02 | TOILET & BATH ACCESSORIES | EA | 1.000 | 1.000 |
| 0701 0213 | ACCESSORIES FOR TYPICAL ENLISTED OR OFFICER DORM UNIT | EA | 1.000 | 1.000 |
| 0702 | BUILT-IN SPECIALTIES | SF | 600.000 | 600.000 |
| 0702 02 | CABINETS | LF | 12.000 | 12.000 |
| 0702 0203 | KTCHN CAB. - PREFINISHED HARDWD W/PLASTIC LAMINATE TOP | LF | 10.000 | 10.000 |
| 0702 0204 | BATHROOM VANITY 30" WIDE X 24" DEEP X 34" HIGH | LF | 2.000 | 2.000 |
| 0702 05 | FIRE EXTINGUISHER CABINETS | EA | 1.000 | 1.000 |
| 0702 0501 | FIRE EXTINGUISHER CABINET, 8" X 12" X 27" | EA | 1.000 | 1.000 |
| | **NURSING** | | | |
| 0701 | GENERAL SPECIALTIES | SF | 400.000 | 400.000 |
| 0701 01 | COMPARTMENTS, CUBICLES, AND TOILET PARTITIONS | EA | 1.000 | 1.000 |
| 0701 0102 | TOILET PARTITION AND ACCESSORIES | EA | 1.000 | 1.000 |
| 0701 0106 | LAVORATORY ACCESSORIES | EA | 1.000 | 1.000 |
| 0702 | BUILT-IN SPECIALTIES | SF | 400.000 | 400.000 |
| | **OFFICE - CLOSED OFFICE SPACE** | | | |
| 0701 | GENERAL SPECIALTIES | SF | 544.000 | 544.000 |
| 0701 03 | CHALK & TACKBOARDS | SF | 4.000 | 4.000 |
| 0701 0301 | PORCELAIN ENAMEL CHALKBOARD | SF | 4.000 | 4.000 |
| 0701 06 | SHELVING | LF | 2.000 | 2.000 |
| 0701 0601 | 10" WIDE STOCK PREFINISHED SHELVES WITH SUPPORTS | LF | 2.000 | 2.000 |
| 0702 | BUILT-IN SPECIALTIES | SF | 544.000 | 544.000 |
| 0702 01 | COUNTERS | LF | 1.000 | 1.000 |
| 0702 0101 | PLASTIC LAMINATE COUNTERTOP WITH BACKSPLASH | LF | 1.000 | 1.000 |
| 0702 02 | CABINETS | LF | 1.000 | 1.000 |
| 0702 0201 | PLASTIC LAMINATE CABINETS WITH COUNTERTOP AND DRAWERS | LF | 1.000 | 1.000 |
| | **QUARTERS - ENLISTED (544 SF/UNIT)** | | | |
| 0701 | GENERAL SPECIALTIES | SF | 7,760.000 | 7,760.000 |
| 0701 02 | TOILET & BATH ACCESSORIES | EA | 25.000 | 25.000 |
| 0701 0213 | ACCESSORIES FOR TYPICAL ENLISTED OR OFFICER DORM UNIT | EA | 25.000 | 25.000 |
| 0701 06 | SHELVING | LF | 630.000 | 630.000 |
| 0701 0601 | 10" WIDE STOCK PREFINISHED SHELVES WITH SUPPORTS | LF | 630.000 | 630.000 |
| 0702 | BUILT-IN SPECIALTIES | SF | 7,760.000 | 7,760.000 |

GENERIC NURSING HOME MODEL, INPUT PARAMETERS, PROJECT DEFINITION RUN

| | | UM | MODEL/ESTIMATED QUANTITY | USER QUANTITY |
|---|---|---|---|---|
| 0702 02 | CABINETS | LF | 100.000 | 100.000 |
| 0702 0202 | CUSTOM BATHRM VANITY - PREFINISHED W/PLASTIC LAM TOP | LF | 100.000 | 100.000 |
| | STORAGE - GENERAL PURPOSE | | | |
| 0701 | GENERAL SPECIALTIES | SF | 400.000 | 400.000 |
| 0702 | BUILT-IN SPECIALTIES | SF | 400.000 | 400.000 |
| | FACILITY TOTAL | | | |
| 0701 | GENERAL SPECIALTIES | SF | 21,058.000 | 21,058.000 |
| 0701 01 | COMPARTMENTS, CUBICLES, AND TOILET PARTITIONS | EA | 29.000 | 4.000 * |
| 0701 0101 | URINAL SCREENS | EA | 1.000 | 1.000 |
| 0701 0102 | TOILET PARTITION AND ACCESSORIES | EA | 3.000 | 3.000 |
| 0701 0103 | TOILET PARTITIONS - PORCELAIN ENAMELED STEEL, WALL HUNG | EA | 1.000 | 1.000 |
| 0701 0106 | LAVORATORY ACCESSORIES | EA | 2.000 | 2.000 |
| 0701 02 | TOILET & BATH ACCESSORIES | EA | 36.000 | 33.000 * |
| 0701 0201 | TOILET PAPER HOLDER | EA | 1.000 | 1.000 |
| 0701 0202 | SANITARY NAPKIN DISPENSER | EA | 1.000 | 1.000 |
| 0701 0203 | PAPER TOWEL DISPENSER AND WASTE RECEPTACLE | EA | 1.000 | 1.000 |
| 0701 0206 | GRAB BARS | EA | 1.000 | 1.000 |
| 0701 0207 | BATH ROOM MIRRORS | EA | 2.000 | 2.000 |
| 0701 0209 | SANITARY NAPKIN AND TAMPON RECEPTACLE | EA | 1.000 | 1.000 |
| 0701 0210 | SOAP DISPENSER | EA | 2.000 | 2.000 |
| 0701 0213 | ACCESSORIES FOR TYPICAL ENLISTED OR OFFICER DORM UNIT | EA | 26.000 | 26.000 |
| 0701 03 | CHALK & TACKBOARDS | SF | 39.000 | 4.000 * |
| 0701 0301 | PORCELAIN ENAMEL CHALKBOARD | SF | 4.000 | 4.000 |
| 0701 04 | IDENTIFYING DEVICES | EA | 40.000 | 40.000 |
| 0701 0403 | BRONZE LETTERS WITH SATIN FINISH 8" HIGH | EA | 4.000 | 4.000 |
| 0701 0406 | ALUMINUM FRAMED GLASS COVERED DIRECTORY BOARD | EA | 3.000 | 3.000 |
| 0701 06 | SHELVING | LF | 1,006.000 | 948.000 * |
| 0701 0601 | 10" WIDE STOCK PREFINISHED SHELVES WITH SUPPORTS | LF | 948.000 | 948.000 |
| 0702 | BUILT-IN SPECIALTIES | SF | 21,058.000 | 21,058.000 |
| 0702 01 | COUNTERS | LF | 24.000 | 24.000 |
| 0702 0101 | PLASTIC LAMINATE COUNTERTOP WITH BACKSPLASH | LF | 24.000 | 24.000 |
| 0702 02 | CABINETS | LF | 114.000 | 114.000 |
| 0702 0201 | PLASTIC LAMINATE CABINETS WITH COUNTERTOP AND DRAWERS | LF | 1.000 | 1.000 |
| 0702 0202 | CUSTOM BATHRM VANITY - PREFINISHED W/PLASTIC LAM TOP | LF | 100.000 | 100.000 |
| 0702 0203 | KTCHN CAB. - PREFINISHED HARDWD W/PLASTIC LAMINATE TOP | LF | 10.000 | 10.000 |
| 0702 0204 | BATHROOM VANITY 30" WIDE X 24" DEEP X 34" HIGH | LF | 2.000 | 2.000 |

* THIS VALUE WAS INPUT BY THE USER.

GENERIC NURSING HOME MODEL, INPUT PARAMETERS, PROJECT DEFINITION RUN

| | | UM | MODEL/ESTIMATED QUANTITY | USER QUANTITY |
|---|---|---|---|---|
| 0702 0210 | METAL BASE AND WALL CABINETS | LF | 1.000 | 1.000 |
| 0702 05 | FIRE EXTINGUISHER CABINETS | EA | 1,000 | 1.000 |
| 0702 0501 | FIRE EXTINGUISHER CABINET, 8" X 12" X 27" | EA | 1.000 | 1.000 |
| 08 | PLUMBING | | | |
| 0801 | DOMESTIC WATER SUPPLY | EA | 104.000 | 104.000 |
| 0801 01 | PIPE & FITTINGS | EA | 104.000 | 104.000 |
| 0801 0101 | COPPER PIPE & FITTINGS | EA | 104.000 | 104.000 |
| 0801 02 | VALVES & HYDRANTS | EA | 49.000 | 49.000 |
| 0801 0201 | VALVES & HYDRANTS | EA | 49.000 | 49.000 |
| 0801 03 | DOMESTIC WATER SUPPLY EQUIPMENT | EA | 1.000 | 1.000 |
| 0801 0306 | DOMESTIC HOT WATER HEATERS | EA | 1.000 | 1.000 |
| 0801 04 | INSULATION | EA | 104.000 | 104.000 |
| 0801 0401 | FIBERGLASS 1-1/2" PIPE INSULATION WITH VAPOR BARRIER | EA | 104.000 | 104.000 |
| 0802 | SANITARY WASTE & VENT SYSTEM | EA | 108.000 | 108.000 |
| 0802 01 | WASTE PIPE & FITTINGS | EA | 108.000 | 108.000 |
| 0802 0101 | WASTE PIPE & FITTINGS ORDINARY FAC. | EA | 108.000 | 108.000 |
| 0802 02 | VENT PIPE & FITTINGS | EA | 108.000 | 108.000 |
| 0802 0201 | C.I. NO HUB VENT PIPE SYSTM | EA | 108.000 | 108.000 |
| 0802 03 | FLOOR DRAINS | EA | 3.000 | 3.000 |
| 0802 0304 | MEDIUM DUTY AND HEAVY DUTY CAST IRON FLOOR DRAINS, ADTL | EA | 3.000 | 3.000 |
| 0803 | RAINWATER DRAINAGE SYSTEM | SF | 22,290.000 | 22,290.000 |
| 0803 01 | PIPE & FITTINGS | LF | 603.000 | 603.000 |
| 0803 0101 | RAINWATER DRAINAGE PIPING | LF | 603.000 | 603.000 |
| 0803 02 | ROOF DRAINS | EA | 24.000 | 24.000 |
| 0803 0203 | 4" TO 3" CAST IRON ROOF DRAINS WITH ALUMINUM DOME | EA | 24.000 | 24.000 |
| | ADMIN MODULE - MEDIUM | | | |
| 0804 | PLUMBING FIXTURES | EA | 2.000 | 2.000 |
| 0804 01 | WATER CLOSETS | EA | 1.000 | 1.000 |
| 0804 0103 | ELONGATED, FLOOR MOUNTED WATER CLOSET | EA | 1.000 | 1.000 |
| 0804 02 | URINALS | EA | 1.000 | 1.000 |
| 0804 0204 | WHITE CHINA URINAL - WALL HUNG | EA | 1.000 | 1.000 |
| 0804 03 | LAVATORIES | EA | 1.000 | 1.000 |
| 0804 0306 | VITREOUS CHINA WALL HUNG LAVATORY WITH ROUGH-IN | EA | 1.000 | 1.000 |
| 0804 06 | DRINKING FOUNTAINS & COOLERS | EA | 1.000 | 1.000 |
| 0804 0604 | ELECTRIC WALL HUNG WATER FOUNTAIN | EA | 1.000 | 1.000 |
| | BUILDING SUPPORT AREA | | | |
| 0804 | PLUMBING FIXTURES | EA | 25.000 | 25.000 |

GENERIC NURSING HOME MODEL, INPUT PARAMETERS, PROJECT DEFINITION RUN

| | | UM | MODEL/ESTIMATED QUANTITY | USER QUANTITY |
|---|---|---|---|---|
| 0804 01 | WATER CLOSETS | EA | 10.000 | .000 * |
| 0804 02 | URINALS | EA | 3.000 | .000 * |
| 0804 03 | LAVATORIES | EA | 9.000 | .000 * |
| 0804 04 | SINKS | EA | 2.000 | 2.000 |
| 0804 0408 | WALL HUNG 24" BY 20" JANITORS SINK OF PORCELAIN ENAMEL | EA | 2.000 | 2.000 |
| 0804 06 | DRINKING FOUNTAINS & COOLERS | EA | 2.000 | 2.000 |
| 0804 0606 | HANDICAPPED TYPE 8 GPM WATER COOLER W/ROUGH IN | EA | 2.000 | 2.000 |
| | DINING AREA; 40-250 PERSON | | | |
| 0804 | PLUMBING FIXTURES | EA | 5.000 | 5.000 |
| 0804 01 | WATER CLOSETS | EA | 2.000 | 2.000 |
| 0804 0103 | ELONGATED, FLOOR MOUNTED WATER CLOSET | EA | 2.000 | 2.000 |
| 0804 02 | URINALS | EA | 1.000 | 1.000 |
| 0804 0203 | WALL MOUNTED - URINAL, WASH DOWN TYPE | EA | 1.000 | 1.000 |
| 0804 03 | LAVATORIES | EA | 2.000 | 2.000 |
| 0804 0308 | CAST IRON, WALLHUNG LAVATORY | EA | 2.000 | 2.000 |
| 0804 04 | SINKS | EA | 1.000 | 1.000 |
| 0804 0406 | SERVICE SINK - ENAMELED CAST IRON | EA | 1.000 | 1.000 |
| 0804 06 | DRINKING FOUNTAINS & COOLERS | EA | 1.000 | 1.000 |
| 0804 0603 | HANDICAPPED ELECTRIC WATER COOLER, WALL MOUNTED | EA | 1.000 | 1.000 |
| | LAUNDRY, STORAGE, AND MAID'S ROOM | | | |
| 0804 | PLUMBING FIXTURES | EA | 10.000 | 10.000 |
| 0804 01 | WATER CLOSETS | EA | 1.000 | 1.000 |
| 0804 0101 | FLOOR MOUNTED - WATER CLOSET | EA | 1.000 | 1.000 |
| 0804 03 | LAVATORIES | EA | 1.000 | 1.000 |
| 0804 0308 | CAST IRON, WALLHUNG LAVATORY | EA | 1.000 | 1.000 |
| 0804 04 | SINKS | EA | 2.000 | 2.000 |
| 0804 0403 | 25" BY 22" SINGLE BOWL KITCHEN SINK OF STAINLESS STEEL | EA | 1.000 | 1.000 |
| 0804 0407 | JANITOR SINK - FLOOR TYPE | EA | 2.000 | 2.000 |
| | LOUNGE AND GAME ROOM | | | |
| 0804 | PLUMBING FIXTURES | EA | 2.000 | 2.000 |
| 0804 01 | WATER CLOSETS | EA | 1.000 | 1.000 |
| 0804 0101 | FLOOR MOUNTED - WATER CLOSET | EA | 1.000 | 1.000 |
| 0804 04 | SINKS | EA | 1.000 | 1.000 |
| 0804 0401 | STAINLESS STEEL - SINGLE BOWL | EA | 1.000 | 1.000 |
| 0804 06 | DRINKING FOUNTAINS & COOLERS | EA | 1.000 | 1.000 |

* THIS VALUE WAS INPUT BY THE USER.

GENERIC NURSING HOME MODEL, INPUT PARAMETERS, PROJECT DEFINITION RUN

| | | UM | MODEL/ESTIMATED QUANTITY | USER QUANTITY |
|---|---|---|---|---|
| 0804 0601 | 8 GPH ELECTIC WATER COOLER - WALL MOUNTED | EA | 1.000 | 1.000 |
| | **NURSING** | | | |
| 0804 | PLUMBING FIXTURES | EA | 2.000 | 2.000 |
| 0804 01 | WATER CLOSETS | EA | 1.000 | 1.000 |
| 0804 0103 | ELONGATED, FLOOR MOUNTED WATER CLOSET | EA | 1.000 | 1.000 |
| 0804 03 | LAVATORIES | EA | 1.000 | 1.000 |
| 0804 0306 | VITREOUS CHINA WALL HUNG LAVATORY WITH ROUGH-IN | EA | 1.000 | 1.000 |
| 0804 04 | SINKS | EA | 1.000 | 1.000 |
| 0804 0404 | MEDICAL SINKS | EA | 1.000 | 1.000 |
| 0804 05 | SHOWERS/TUBS | EA | 1.000 | 1.000 |
| 0804 0502 | SHOWER VALVE, DRAIN FOR CERAMIC TILE SHOWER | EA | 1.000 | 1.000 |
| 0804 0504 | PORCELAIN ENAMEL CAST IRON BATHTUB | EA | 1.000 | 1.000 |
| | **QUARTERS - ENLISTED (544 SF/UNIT)** | | | |
| 0804 | PLUMBING FIXTURES | EA | 57.000 | 57.000 |
| 0804 01 | WATER CLOSETS | EA | 14.000 | 14.000 |
| 0804 0101 | FLOOR MOUNTED - WATER CLOSET | EA | 14.000 | 14.000 |
| 0804 03 | LAVATORIES | EA | 29.000 | 29.000 |
| 0804 0304 | 26" BY 18" WHITE OVAL LAVATORY | EA | 29.000 | 29.000 |
| 0804 05 | SHOWERS/TUBS | EA | 14.000 | 14.000 |
| 0804 0505 | PORCELAIN ENAMELED STEEL BATHTUB | EA | 14.000 | 14.000 |
| | **FACILITY TOTAL** | | | |
| 0804 | PLUMBING FIXTURES | EA | 103.000 | 103.000 |
| 0804 01 | WATER CLOSETS | EA | 30.000 | 20.000 * |
| 0804 0101 | FLOOR MOUNTED - WATER CLOSET | EA | 16.000 | 16.000 |
| 0804 0103 | ELONGATED, FLOOR MOUNTED WATER CLOSET | EA | 4.000 | 4.000 |
| 0804 02 | URINALS | EA | 5.000 | 2.000 * |
| 0804 0203 | WALL MOUNTED - URINAL, WASH DOWN TYPE | EA | 1.000 | 1.000 |
| 0804 0204 | WHITE CHINA URINAL - WALL HUNG | EA | 1.000 | 1.000 |
| 0804 03 | LAVATORIES | EA | 43.000 | 34.000 * |
| 0804 0304 | 26" BY 18" WHITE OVAL LAVATORY | EA | 29.000 | 29.000 |
| 0804 0306 | VITREOUS CHINA WALL HUNG LAVATORY WITH ROUGH-IN | EA | 2.000 | 2.000 |
| 0804 0308 | CAST IRON, WALLHUNG LAVATORY | EA | 3.000 | 3.000 |
| 0804 04 | SINKS | EA | 7.000 | 7.000 |
| 0804 0401 | STAINLESS STEEL - SINGLE BOWL | EA | 1.000 | 1.000 |
| 0804 0403 | 25" BY 22" SINGLE BOWL KITCHEN SINK OF STAINLESS STEEL | EA | 1.000 | 1.000 |

* THIS VALUE WAS INPUT BY THE USER.

GENERIC NURSING HOME MODEL, INPUT PARAMETERS, PROJECT DEFINITION RUN

| | | UM | MODEL/ESTIMATED QUANTITY | USER QUANTITY |
|---|---|---|---|---|
| 0804 0404 | MEDICAL SINKS | EA | 1.000 | 1.000 |
| 0804 0406 | SERVICE SINK - ENAMELED CAST IRON | EA | 1.000 | 1.000 |
| 0804 0407 | JANITOR SINK - FLOOR TYPE | EA | 2.000 | 2.000 |
| 0804 0408 | WALL HUNG 24" BY 20" JANITORS SINK OF PORCELAIN ENAMEL | EA | 2.000 | 2.000 |
| 0804 05 | SHOWERS/TUBS | EA | 15.000 | 15.000 |
| 0804 0502 | SHOWER VALVE, DRAIN FOR CERAMIC TILE SHOWER | EA | 1.000 | 1.000 |
| 0804 0504 | PORCELAIN ENAMEL CAST IRON BATHTUB | EA | 1.000 | 1.000 |
| 0804 0505 | PORCELAIN ENAMELED STEEL BATHTUB | EA | 14.000 | 14.000 |
| 0804 06 | DRINKING FOUNTAINS & COOLERS | EA | 5.000 | 5.000 |
| 0804 0601 | 8 GPH ELECTIC WATER COOLER - WALL MOUNTED | EA | 1.000 | 1.000 |
| 0804 0603 | HANDICAPPED ELECTRIC WATER COOLER, WALL MOUNTED | EA | 1.000 | 1.000 |
| 0804 0604 | ELECTRIC WALL HUNG WATER FOUNTAIN | EA | 1.000 | 1.000 |
| 0804 0606 | HANDICAPPED TYPE 8 GPM WATER COOLER W/ROUGH IN | EA | 2.000 | 2.000 |
| 09 | H.V.A.C | | | |
| 0901 | ENERGY SUPPLY | MBH | 255.000 | 255.000 |
| 0901 02 | GAS SUPPLY SYSTEM | MBH | 459.000 | 459.000 |
| 0901 0206 | 900 MBH GAS SUPPLY | EA | 1.000 | 1.000 |
| 0901 05 | HOT WATER SUPPLY SYSTEM | MBH | 255.000 | 255.000 |
| 0902 | HEAT GENERATING SYSTEM | MBH | 255.000 | 255.000 |
| 0902 01 | STEAM BOILERS AND PIPING | MBH | 255.000 | 255.000 |
| 0902 02 | HOT WATER BOILERS AND PIPING | MBH | 255.000 | 255.000 |
| 0902 0216 | HOT WATER BOILER, GAS FIRED 320 MBH | EA | 1.000 | 1.000 |
| 0902 03 | FURNACES | MBH | 255.000 | 255.000 |
| 0903 | COOLING GENERATING SYSTEM | TONS | 20.180 | 20.180 |
| 0903 01 | CHILLED WATER SYSTEMS | TONS | 20.000 | 20.000 |
| 0903 0102 | 20 TON AIR COOLED RECIP. CHILLER W/MECH. ROOM PIPING | EA | 1.000 | 1.000 |
| 0903 02 | DIRECT EXPANSION SYSTEMS | TONS | 20.000 | 20.000 |
| 0904 | DISTRIBUTION SYSTEMS | MBH | 497.000 | 497.000 |
| 0904 01 | AIR DISTRIBUTION, COOLING AND HEATING | MCFM | 7.167 | 7.167 |
| 0904 0101 | .3 MCFM FAN COIL UNIT ASSEMBLY | MCFM | 6.705 | 6.705 |
| 0904 0116 | 1.6MCFM AHU WITH HEAT COIL & OUTSIDE AIR INTAKE | MCFM | .462 | .462 |
| 0904 07 | CHILLED WATER DISTRIBUTION SYSTEM | TONS | 20.000 | 20.000 |
| 0904 0704 | CHILLED WATER DISTRIBUTION FOR BOQ (40 TONS 83 UNITS) | TON | 20.000 | 20.000 |
| 0905 | TERMINAL & PACKAGE UNITS | MBH | 497.000 | 497.000 |
| 0906 | CONTROLS & INSTRUMENTATION | MBH | 497.000 | 497.000 |
| 0907 | SYSTEMS TESTING & BALANCING | MBH | 497.000 | 497.000 |

GENERIC NURSING HOME MODEL, INPUT PARAMETERS, PROJECT DEFINITION RUN

| | | UM | MODEL/ESTIMATED QUANTITY | USER QUANTITY |
|---|---|---|---|---|
| 0907 01 | WATER SIDE TESTING & BALANCING, HEATING AND COOLING | EA | 25.000 | 25.000 |
| 0907 0102 | WATER TEST & BALANCE BOILER | EA | 1.000 | 1.000 |
| 0907 0105 | WATER, TEST & BALANCE CHILLER | EA | 1.000 | 1.000 |
| 0907 0107 | WATER, TEST & BALANCE FAN COIL, FIN TUBE | EA | 24.000 | 24.000 |
| 0907 0109 | WATER, TEST & BALANCE PUMP | EA | 1.000 | 1.000 |
| 0907 02 | AIR SIDE TESTING & BALANCING, HEATNG, COOLNG & EXH SYST | EA | 73.000 | 73.000 |
| 0907 0202 | TEST & BALANCE H & V UNIT/IN LINE FAN | EA | 24.000 | 24.000 |
| 0907 0204 | TEST & BALANCE ROOF EXHAUST FAN | EA | 1.000 | 1.000 |
| 0907 0212 | TEST & BALANCE REGISTER AVERAGE CEILING HEIGHT | EA | 48.000 | 48.000 |
| 0908 | VENTILATING/EXHAUST SYSTEMS | MCFM | 1.459 | 1.459 |
| 0908 01 | EXHAUST DISTRIBUTION SYSTEMS | MCFM | 1.459 | 1.459 |
| 0908 0130 | .2 MCFM EXHAUST SYSTEM FOR BOQ | MCFM | .136 | .136 |
| 0908 0194 | 1.95 MCFM EXHAUST SYSTEM FOR BOQ | MCFM | 1.323 | 1.323 |
| 10 | SPECIAL MECHANICAL SYSTEMS | | | |
| 1001 | FIRE PROTECTION | SF | 21,058.000 | 21,058.000 |
| 1001 01 | WATER SUPPLY (FIRE PROTECTION) | EA | 216.000 | 216.000 |
| 1001 0105 | FIRE PROTECTION WATER SUPPLY | EA | 216.000 | 216.000 |
| 1001 02 | SPRINKLERS | EA | 216.000 | 216.000 |
| 1001 0202 | CONCEALED SPRINKLER HEADS, PIPES & FITTINGS -ORD. HAZ. | EA | 216.000 | 216.000 |
| | ADMIN MODULE - MEDIUM | | | |
| 1002 | OTHER SPECIAL MECHANICAL SYSTEMS | SF | 720.000 | 720.000 |
| | BUILDING SUPPORT AREA | | | |
| 1002 | OTHER SPECIAL MECHANICAL SYSTEMS | SF | 5,850.000 | 5,850.000 |
| | COVERED EXTERIOR ENTRYWAY | | | |
| 1002 | OTHER SPECIAL MECHANICAL SYSTEMS | SF | 384.000 | 384.000 |
| | DINING AREA; 40-250 PERSON | | | |
| 1002 | OTHER SPECIAL MECHANICAL SYSTEMS | SF | 3,200.000 | 3,200.000 |
| | LAUNDRY, STORAGE, AND MAID'S ROOM | | | |
| 1002 | OTHER SPECIAL MECHANICAL SYSTEMS | SF | 1,200.000 | 1,200.000 |

GENERIC NURSING HOME MODEL, INPUT PARAMETERS, PROJECT DEFINITION RUN

| | | | | |
|---|---|---|---|---|
| | LOUNGE AND GAME ROOM | | | |
| 1002 | OTHER SPECIAL MECHANICAL SYSTEMS | SF | 600.000 | 600.000 |
| | NURSING | | | |
| 1002 | OTHER SPECIAL MECHANICAL SYSTEMS | SF | 400.000 | 400.000 |
| | OFFICE - CLOSED OFFICE SPACE | | | |
| 1002 | OTHER SPECIAL MECHANICAL SYSTEMS | SF | 544.000 | 544.000 |
| | QUARTERS - ENLISTED (544 SF/UNIT) | | | |
| 1002 | OTHER SPECIAL MECHANICAL SYSTEMS | SF | 7,760.000 | 7,760.000 |
| | STORAGE - GENERAL PURPOSE | | | |
| 1002 | OTHER SPECIAL MECHANICAL SYSTEMS | SF | 400.000 | 400.000 |
| | FACILITY TOTAL | | | |
| 1002 | OTHER SPECIAL MECHANICAL SYSTEMS | SF | 21,058.000 | 21,058.000 |
| 11 | ELECTRICAL | | | |
| 1101 | SERVICE AND DISTRIBUTION | AMPS | 447.000 | 447.000 |
| 1101 01 | MAIN TRANSFORMER | AMPS | 447.000 | .000 * |
| 1101 02 | SECONDARY | AMPS | 447.000 | .000 * |
| 1101 03 | MAIN SWITCHBOARD | AMPS | 447.000 | 447.000 |
| 1101 0306 | UNGRD 600 AMP MAIN SWITCHBOARD | EA | 1.000 | 1.000 |
| 1101 05 | PANELS | AMPS | 447.000 | 447.000 |
| 1101 0501 | PANELBD 208V 100A 24 CIR MLO W/BKR | EA | 3.000 | 3.000 |
| 1101 0506 | PANELBD 208V 225A 36 CIR MLO W/BKR | EA | 2.000 | 2.000 |
| 1101 0536 | PANELBD 480V 225A 36 CIR MLO W/BKR | EA | 1.000 | 1.000 |
| 1101 0537 | PANELBD 480V 225A 42 CIR MLO W/BKR | EA | 1.000 | 1.000 |
| | ADMIN MODULE - MEDIUM | | | |
| 1102 | LIGHTING & POWER | SF | 720.000 | 720.000 |

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GENERIC NURSING HOME MODEL, INPUT PARAMETERS, PROJECT DEFINITION RUN

| | | UM | MODEL/ESTIMATED QUANTITY | USER QUANTITY |
|---|---|---|---|---|
| 1102 01 | BRANCH WIRING | EA | 8.000 | 8.000 |
| 1102 0101 | 120 VOLT, 20 AMP DUPLEX RECEPTACLE - STUD PARTITION | EA | 7.000 | 7.000 |
| 1102 0116 | 120 VOLT, 30 AMP TWISTLOCK RECEPTACLE | EA | 1.000 | 1.000 |
| 1102 02 | LIGHTING EQUIPMENT | EA | 11.000 | 11.000 |
| 1102 0202 | 2' X 4' LAY-IN FLUORESCENT FIXTURE | EA | 10.000 | 10.000 |
| 1102 0220 | CEILING RECESSED INCANDESCENT 100 WATT FIXTURE | EA | 1.000 | 1.000 |
| | BUILDING SUPPORT AREA | | | |
| 1102 | LIGHTING & POWER | SF | 5,850.000 | 5,850.000 |
| 1102 01 | BRANCH WIRING | EA | 78.000 | 10.000 * |
| 1102 0101 | 120 VOLT, 20 AMP DUPLEX RECEPTACLE - STUD PARTITION | EA | 2.000 | 2.000 |
| 1102 0102 | 120 VOLT, 20 AMP DUPLEX RECEPTACLE - MASONRY PARTITION | EA | 2.000 | 2.000 |
| 1102 0107 | 120 VOLT, 15 AMP DUPLEX GROUND FAULT RECEPTACLE | EA | 5.000 | 5.000 |
| 1102 0137 | EQUIPMENT CONNECTIONS FOR UP TO 10 HP | EA | 1.000 | 1.000 |
| 1102 0138 | 480 VOLT EQUIPMENT CONNECTIONS FOR MOTORS - 15 TO 25 HP | EA | 1.000 | 1.000 |
| 1102 0139 | 480 VOLT EQUIPMENT CONNECTIONS FOR MOTORS - 30 TO 40 HP | EA | 1.000 | 1.000 |
| 1102 02 | LIGHTING EQUIPMENT | EA | 88.000 | 44.000 * |
| 1102 0201 | FOUR FOOT STRIP FLOURESCENT FIXTURE | EA | 5.000 | 5.000 |
| 1102 0202 | 2' X 4' LAY-IN FLUORESCENT FIXTURE | EA | 33.000 | 33.000 |
| 1102 0220 | CEILING RECESSED INCANDESCENT 100 WATT FIXTURE | EA | 6.000 | 6.000 |
| | COVERED EXTERIOR ENTRYWAY | | | |
| 1102 | LIGHTING & POWER | SF | 384.000 | 384.000 |
| 1102 02 | LIGHTING EQUIPMENT | EA | 2.000 | 2.000 |
| 1102 0229 | 100W HPS WALL MOUNT | EA | 1.000 | 1.000 |
| 1102 0235 | 150 WATT HPS RECESSED FIXTURE | EA | 1.000 | 1.000 |
| | DINING AREA; 40-250 PERSON | | | |
| 1102 | LIGHTING & POWER | SF | 3,200.000 | 3,200.000 |
| 1102 01 | BRANCH WIRING | EA | 13.000 | 13.000 |
| 1102 0102 | 120 VOLT, 20 AMP DUPLEX RECEPTACLE - MASONRY PARTITION | EA | 9.000 | 9.000 |
| 1102 0103 | DUPLEX RECEPTACLE LONG RUN | EA | 3.000 | 3.000 |
| 1102 0136 | EQUIPMENT CONNECTIONS FOR UP TO 5 HP | EA | 2.000 | 2.000 |
| 1102 02 | LIGHTING EQUIPMENT | EA | 60.000 | 60.000 |
| 1102 0201 | FOUR FOOT STRIP FLOURESCENT FIXTURE | EA | 1.000 | 1.000 |
| 1102 0202 | 2' X 4' LAY-IN FLUORESCENT FIXTURE | EA | 1.000 | 1.000 |
| 1102 0205 | FLORESCENT TROFFER W/ PARABOLIC BAFFLE | EA | 15.000 | 15.000 |
| 1102 0221 | RECESSED INCANDESCENT SQUARE FIXTURE | EA | 40.000 | 40.000 |

* THIS VALUE WAS INPUT BY THE USER.

GENERIC NURSING HOME MODEL, INPUT PARAMETERS, PROJECT DEFINITION RUN

| Code | Description | UM | MODEL/ESTIMATED QUANTITY | USER QUANTITY |
|---|---|---|---|---|
| 1102 0235 | 150 WATT HPS RECESSED FIXTURE | EA | 3.000 | 3.000 |
| 1102 0272 | EXIT LIGHT WITH BATTERY BACKUP | EA | 1.000 | 1.000 |
| | LAUNDRY, STORAGE, AND MAID'S ROOM | | | |
| 1102 | LIGHTING & POWER | SF | 1,200.000 | 1,200.000 |
| 1102 01 | BRANCH WIRING | EA | 10.000 | 10.000 |
| 1102 0103 | DUPLEX RECEPTACLE LONG RUN | EA | 8.000 | 8.000 |
| 1102 0136 | EQUIPMENT CONNECTIONS FOR UP TO 5 HP | EA | 1.000 | 1.000 |
| 1102 0156 | 120V 20A SINGLE POLE SWITCH | EA | 1.000 | 1.000 |
| 1102 02 | LIGHTING EQUIPMENT | EA | 13.000 | 13.000 |
| 1102 0204 | 277 VOLT 2' X 4' FLUORESCENT FIXTURE | EA | 2.000 | 2.000 |
| 1102 0214 | SURFACE MOUNTED 1' X 4' FLUORESCENT FIXTURE | EA | 2.000 | 2.000 |
| 1102 0220 | CEILING RECESSED INCANDESCENT 100 WATT FIXTURE | EA | 5.000 | 5.000 |
| 1102 0272 | EXIT LIGHT WITH BATTERY BACKUP | EA | 4.000 | 4.000 |
| | LOUNGE AND GAME ROOM | | | |
| 1102 | LIGHTING & POWER | SF | 600.000 | 600.000 |
| 1102 01 | BRANCH WIRING | EA | 5.000 | 5.000 |
| 1102 0103 | DUPLEX RECEPTACLE LONG RUN | EA | 1.000 | 1.000 |
| 1102 0108 | DUPLEX GFI RECEPTACLE LONG RUN | EA | 4.000 | 4.000 |
| 1102 0138 | 480 VOLT EQUIPMENT CONNECTIONS FOR MOTORS - 15 TO 25 HP | EA | 1.000 | 1.000 |
| 1102 0156 | 120V 20A SINGLE POLE SWITCH | EA | 1.000 | 1.000 |
| 1102 02 | LIGHTING EQUIPMENT | EA | 5.000 | 5.000 |
| 1102 0230 | 100W MERCURY VAPOR WALLMOUNT | EA | 4.000 | 4.000 |
| 1102 0235 | 150 WATT HPS RECESSED FIXTURE | EA | 1.000 | 1.000 |
| 1102 0272 | EXIT LIGHT WITH BATTERY BACKUP | EA | 1.000 | 1.000 |
| 1102 0274 | 6V EMERGENCY BATTERY PACK | EA | 1.000 | 1.000 |
| | NURSING | | | |
| 1102 | LIGHTING & POWER | SF | 400.000 | 400.000 |
| 1102 01 | BRANCH WIRING | EA | 5.000 | 5.000 |
| 1102 0101 | 120 VOLT, 20 AMP DUPLEX RECEPTACLE - STUD PARTITION | EA | 2.000 | 2.000 |
| 1102 0106 | 120 VOLT, 15 AMP DUPLEX GROUND FAULT RECEPTACLE | EA | 2.000 | 2.000 |
| 1102 0116 | 120 VOLT, 30 AMP TWISTLOCK RECEPTACLE | EA | 1.000 | 1.000 |
| 1102 0121 | 230 VOLT, 30 AMP RECEPTACLE - STUD PARTITION | EA | 1.000 | 1.000 |
| 1102 0136 | EQUIPMENT CONNECTIONS FOR UP TO 5 HP | EA | 1.000 | 1.000 |
| 1102 02 | LIGHTING EQUIPMENT | EA | 6.000 | 6.000 |
| 1102 0201 | FOUR FOOT STRIP FLOURESCENT FIXTURE | EA | 1.000 | 1.000 |

GENERIC NURSING HOME MODEL, INPUT PARAMETERS, PROJECT DEFINITION RUN

| Code | Description | UM | MODEL/ESTIMATED QUANTITY | USER QUANTITY |
|---|---|---|---|---|
| 1102 0202 | 2' X 4' LAY-IN FLUORESCENT FIXTURE | EA | 2.000 | 2.000 |
| 1102 0220 | CEILING RECESSED INCANDESCENT 100 WATT FIXTURE | EA | 1.000 | 1.000 |
| 1102 0222 | RECESSED WALL MOUNTED INCANDESCENT FIXTURE 9" X 4" | EA | 1.000 | 1.000 |
| | **OFFICE - CLOSED OFFICE SPACE** | | | |
| 1102 | LIGHTING & POWER | SF | 544.000 | 544.000 |
| 1102 01 | BRANCH WIRING | EA | 11.000 | 11.000 |
| 1102 0101 | 120 VOLT, 20 AMP DUPLEX RECEPTACLE - STUD PARTITION | EA | 9.000 | 9.000 |
| 1102 0102 | 120 VOLT, 20 AMP DUPLEX RECEPTACLE - MASONRY PARTITION | EA | 2.000 | 2.000 |
| 1102 0121 | 230 VOLT, 30 AMP RECEPTACLE - STUD PARTITION | EA | 1.000 | 1.000 |
| 1102 02 | LIGHTING EQUIPMENT | EA | 10.000 | 10.000 |
| 1102 0202 | 2' X 4' LAY-IN FLUORESCENT FIXTURE | EA | 9.000 | 9.000 |
| 1102 0220 | CEILING RECESSED INCANDESCENT 100 WATT FIXTURE | EA | 1.000 | 1.000 |
| | **QUARTERS - ENLISTED (544 SF/UNIT)** | | | |
| 1102 | LIGHTING & POWER | SF | 7,760.000 | 7,760.000 |
| 1102 01 | BRANCH WIRING | EA | 277.000 | 277.000 |
| 1102 0102 | 120 VOLT, 20 AMP DUPLEX RECEPTACLE - MASONRY PARTITION | EA | 176.000 | 176.000 |
| 1102 0103 | DUPLEX RECEPTACLE LONG RUN | EA | 25.000 | 25.000 |
| 1102 0107 | 120 VOLT, 15 AMP DUPLEX GROUND FAULT RECEPTACLE | EA | 25.000 | 25.000 |
| 1102 0122 | 230 VOLT, 30 AMP RECEPTACLE - MASONRY PARTITION | EA | 25.000 | 25.000 |
| 1102 0156 | 120V 20A SINGLE POLE SWITCH | EA | 25.000 | 25.000 |
| 1102 02 | LIGHTING EQUIPMENT | EA | 202.000 | 202.000 |
| 1102 0201 | FOUR FOOT STRIP FLOURESCENT FIXTURE | EA | 25.000 | 25.000 |
| 1102 0211 | 4' 2 LAMP WALL MOUNT FLORESCENT | EA | 51.000 | 51.000 |
| 1102 0214 | SURFACE MOUNTED 1' X 4' FLUORESCENT FIXTURE | EA | 51.000 | 51.000 |
| 1102 0249 | 150W PENDANT MOUNT INDUSTRIAL FIXTURE | EA | 51.000 | 51.000 |
| 1102 0276 | PORCELAIN LAMP HOLDER | EA | 25.000 | 25.000 |
| | **STORAGE - GENERAL PURPOSE** | | | |
| 1102 | LIGHTING & POWER | SF | 400.000 | 400.000 |
| 1102 01 | BRANCH WIRING | EA | 15.000 | 15.000 |
| 1102 0103 | DUPLEX RECEPTACLE LONG RUN | EA | 14.000 | 14.000 |
| 1102 0137 | EQUIPMENT CONNECTIONS FOR UP TO 10 HP | EA | 1.000 | 1.000 |
| 1102 02 | LIGHTING EQUIPMENT | EA | 9.000 | 9.000 |
| 1102 0203 | 2' X 4' TWO-TUBE TROFFER | EA | 9.000 | 9.000 |
| | **FACILITY TOTAL** | | | |
| 1102 | LIGHTING & POWER | SF | 21,058.000 | 21,058.000 |

GENERIC NURSING HOME MODEL, INPUT PARAMETERS, PROJECT DEFINITION RUN

| | | UM | MODEL/ESTIMATED QUANTITY | USER QUANTITY |
|---|---|---|---|---|
| 1102 01 | BRANCH WIRING | EA | 422.000 | 354.000 * |
| 1102 0101 | 120 VOLT, 20 AMP DUPLEX RECEPTACLE - STUD PARTITION | EA | 20.000 | 20.000 |
| 1102 0102 | 120 VOLT, 20 AMP DUPLEX RECEPTACLE - MASONRY PARTITION | EA | 189.000 | 189.000 |
| 1102 0103 | DUPLEX RECEPTACLE LONG RUN | EA | 51.000 | 51.000 |
| 1102 0106 | 120 VOLT, 15 AMP DUPLEX GROUND FAULT RECEPTACLE | EA | 2.000 | 2.000 |
| 1102 0107 | 120 VOLT, 15 AMP DUPLEX GROUND FAULT RECEPTACLE | EA | 30.000 | 30.000 |
| 1102 0108 | DUPLEX GFI RECEPTACLE LONG RUN | EA | 4.000 | 4.000 |
| 1102 0116 | 120 VOLT, 30 AMP TWISTLOCK RECEPTACLE | EA | 2.000 | 2.000 |
| 1102 0121 | 230 VOLT, 30 AMP RECEPTACLE - STUD PARTITION | EA | 2.000 | 2.000 |
| 1102 0122 | 230 VOLT, 30 AMP RECEPTACLE - MASONRY PARTITION | EA | 25.000 | 25.000 |
| 1102 0136 | EQUIPMENT CONNECTIONS FOR UP TO 5 HP | EA | 4.000 | 4.000 |
| 1102 0137 | EQUIPMENT CONNECTIONS FOR UP TO 10 HP | EA | 2.000 | 2.000 |
| 1102 0138 | 480 VOLT EQUIPMENT CONNECTIONS FOR MOTORS - 15 TO 25 HP | EA | 2.000 | 2.000 |
| 1102 0139 | 480 VOLT EQUIPMENT CONNECTIONS FOR MOTORS - 30 TO 40 HP | EA | 1.000 | 1.000 |
| 1102 0156 | 120V 20A SINGLE POLE SWITCH | EA | 27.000 | 27.000 |
| 1102 02 | LIGHTING EQUIPMENT | EA | 406.000 | 362.000 * |
| 1102 0201 | FOUR FOOT STRIP FLOURESCENT FIXTURE | EA | 32.000 | 32.000 |
| 1102 0202 | 2' X 4' LAY-IN FLUORESCENT FIXTURE | EA | 55.000 | 55.000 |
| 1102 0203 | 2' X 4' TWO-TUBE TROFFER | EA | 9.000 | 9.000 |
| 1102 0204 | 277 VOLT 2' X 4' FLUORESCENT FIXTURE | EA | 2.000 | 2.000 |
| 1102 0205 | FLORESCENT TROFFER W/ PARABOLIC BAFFLE | EA | 15.000 | 15.000 |
| 1102 0211 | 4' 2 LAMP WALL MOUNT FLORESCENT | EA | 51.000 | 51.000 |
| 1102 0214 | SURFACE MOUNTED 1' X 4' FLUORESCENT FIXTURE | EA | 53.000 | 53.000 |
| 1102 0220 | CEILING RECESSED INCANDESCENT 100 WATT FIXTURE | EA | 14.000 | 14.000 |
| 1102 0221 | RECESSED INCANDESCENT SQUARE FIXTURE | EA | 40.000 | 40.000 |
| 1102 0222 | RECESSED WALL MOUNTED INCANDESCENT FIXTURE 9" X 4" | EA | 1.000 | 1.000 |
| 1102 0229 | 100W HPS WALL MOUNT | EA | 1.000 | 1.000 |
| 1102 0230 | 100W MERCURY VAPOR WALLMOUNT | EA | 4.000 | 4.000 |
| 1102 0235 | 150 WATT HPS RECESSED FIXTURE | EA | 5.000 | 5.000 |
| 1102 0249 | 150W PENDANT MOUNT INDUSTRIAL FIXTURE | EA | 51.000 | 51.000 |
| 1102 0272 | EXIT LIGHT WITH BATTERY BACKUP | EA | 6.000 | 6.000 |
| 1102 0274 | 6V EMERGENCY BATTERY PACK | EA | 1.000 | 1.000 |
| 1102 0276 | PORCELAIN LAMP HOLDER | EA | 25.000 | 25.000 |
| 12 | SPECIAL ELECTRICAL SYSTEMS | | | |
| 1201 | COMMUNICATION & ALARM SYSTEMS | SF | 21,058.000 | 21,058.000 |
| 1201 01 | FIRE ALARM SYSTEMS | OUTLT | 68.000 | 68.000 |
| 1201 0102 | FIRE ALARM SYSTEM - RATE OF RISE HEAT DETECTORS | OUT | 67.000 | 67.000 |
| 1201 0104 | FIRE ALARM DUCT SMOKE DETECTOR | EA | 1.000 | 1.000 |
| 1201 0118 | 12-ZONE FACP WITH ANNUM AND TRANSMITTER | EA | 1.000 | 1.000 |
| 1201 03 | TELEPHONE SYSTEMS | OUTLT | 23.000 | .000 * |
| 1201 07 | TELEVISION SYSTEMS | OUTLT | 24.000 | .000 * |
| 1202 | OTHER SPECIAL ELECTRICAL SYSTEMS | SF | 21,058.000 | 21,058.000 |

* THIS VALUE WAS INPUT BY THE USER.

GENERIC NURSING HOME MODEL, INPUT PARAMETERS, PROJECT DEFINITION RUN

| | | UM | MODEL/ESTIMATED QUANTITY | USER QUANTITY |
|---|---|---|---|---|
| 13 | EQUIPMENT | | | |
| | ADMIN MODULE - MEDIUM | | | |
| 1301 | COMMON FIXED & MOVEABLE EQUIPMENT | SF | 720.000 | 720.000 |
| 1302 | SPECIALIZED FIXED & MOVEABLE EQUIPMENT | SF | 720.000 | 720.000 |
| 1303 | FURNISHINGS | SF | 720.000 | 720.000 |
| 1304 | SPECIAL CONSTRUCTION | SF | 720.000 | 720.000 |
| | BUILDING SUPPORT AREA | | | |
| 1301 | COMMON FIXED & MOVEABLE EQUIPMENT | SF | 5,850.000 | 5,850.000 |
| 1302 | SPECIALIZED FIXED & MOVEABLE EQUIPMENT | SF | 5,850.000 | 5,850.000 |
| 1303 | FURNISHINGS | SF | 5,850.000 | 5,850.000 |
| 1304 | SPECIAL CONSTRUCTION | SF | 5,850.000 | 5,850.000 |
| | COVERED EXTERIOR ENTRYWAY | | | |
| 1301 | COMMON FIXED & MOVEABLE EQUIPMENT | SF | 384.000 | 384.000 |
| 1302 | SPECIALIZED FIXED & MOVEABLE EQUIPMENT | SF | 384.000 | 384.000 |
| 1303 | FURNISHINGS | SF | 384.000 | 384.000 |
| 1304 | SPECIAL CONSTRUCTION | SF | 384.000 | 384.000 |
| | DINING AREA; 40-250 PERSON | | | |
| 1301 | COMMON FIXED & MOVEABLE EQUIPMENT | SF | 3,200.000 | 3,200.000 |
| 1302 | SPECIALIZED FIXED & MOVEABLE EQUIPMENT | SF | 3,200.000 | 3,200.000 |
| 1303 | FURNISHINGS | SF | 3,200.000 | 3,200.000 |

GENERIC NURSING HOME MODEL, INPUT PARAMETERS, PROJECT DEFINITION RUN

| | | UM | MODEL/ESTIMATED QUANTITY | USER QUANTITY |
|---|---|---|---|---|
| 1304 | SPECIAL CONSTRUCTION | SF | 3,200.000 | 3,200.000 |
| | LAUNDRY, STORAGE, AND MAID'S ROOM | | | |
| 1301 | COMMON FIXED & MOVEABLE EQUIPMENT | SF | 1,200.000 | 1,200.000 |
| 1302 | SPECIALIZED FIXED & MOVEABLE EQUIPMENT | SF | 1,200.000 | 1,200.000 |
| 1303 | FURNISHINGS | SF | 1,200.000 | 1,200.000 |
| 1304 | SPECIAL CONSTRUCTION | SF | 1,200.000 | 1,200.000 |
| | LOUNGE AND GAME ROOM | | | |
| 1301 | COMMON FIXED & MOVEABLE EQUIPMENT | SF | 600.000 | 600.000 |
| 1302 | SPECIALIZED FIXED & MOVEABLE EQUIPMENT | SF | 600.000 | 600.000 |
| 1303 | FURNISHINGS | SF | 600.000 | 600.000 |
| 1304 | SPECIAL CONSTRUCTION | SF | 600.000 | 600.000 |
| | NURSING | | | |
| 1301 | COMMON FIXED & MOVEABLE EQUIPMENT | SF | 400.000 | 400.000 |
| 1302 | SPECIALIZED FIXED & MOVEABLE EQUIPMENT | SF | 400.000 | 400.000 |
| 1302 01 | MEDICAL EQUIPMENT | EA | 404.000 | 404.000 |
| 1303 | FURNISHINGS | SF | 400.000 | 400.000 |
| 1304 | SPECIAL CONSTRUCTION | SF | 400.000 | 400.000 |
| | OFFICE - CLOSED OFFICE SPACE | | | |
| 1301 | COMMON FIXED & MOVEABLE EQUIPMENT | SF | 544.000 | 544.000 |
| 1302 | SPECIALIZED FIXED & MOVEABLE EQUIPMENT | SF | 544.000 | 544.000 |
| 1303 | FURNISHINGS | SF | 544.000 | 544.000 |

GENERIC NURSING HOME MODEL, INPUT PARAMETERS, PROJECT DEFINITION RUN

| | | UM | MODEL/ESTIMATED QUANTITY | USER QUANTITY |
|---|---|---|---|---|
| 1304 | SPECIAL CONSTRUCTION | SF | 544.000 | 544.000 |
| | **QUARTERS - ENLISTED (544 SF/UNIT)** | | | |
| 1301 | COMMON FIXED & MOVEABLE EQUIPMENT | SF | 7,760.000 | 7,760.000 |
| 1302 | SPECIALIZED FIXED & MOVEABLE EQUIPMENT | SF | 7,760.000 | 7,760.000 |
| 1303 | FURNISHINGS | SF | 7,760.000 | 7,760.000 |
| 1303 02 | WINDOW TREATMENT | SF | 403.000 | 403.000 |
| 1303 0201 | HORIZONTAL BLINDS | SF | 403.000 | 403.000 |
| 1304 | SPECIAL CONSTRUCTION | SF | 7,760.000 | 7,760.000 |
| | **STORAGE - GENERAL PURPOSE** | | | |
| 1301 | COMMON FIXED & MOVEABLE EQUIPMENT | SF | 400.000 | 400.000 |
| 1302 | SPECIALIZED FIXED & MOVEABLE EQUIPMENT | SF | 400.000 | 400.000 |
| 1303 | FURNISHINGS | SF | 400.000 | 400.000 |
| 1304 | SPECIAL CONSTRUCTION | SF | 400.000 | 400.000 |
| | **FACILITY TOTAL** | | | |
| 1301 | COMMON FIXED & MOVEABLE EQUIPMENT | SF | 21,058.000 | 21,058.000 |
| 1302 | SPECIALIZED FIXED & MOVEABLE EQUIPMENT | SF | 21,058.000 | 21,058.000 |
| 1302 01 | MEDICAL EQUIPMENT | EA | 404.000 | 404.000 |
| 1303 | FURNISHINGS | SF | 21,058.000 | 21,058.000 |
| 1303 02 | WINDOW TREATMENT | SF | 403.000 | 403.000 |
| 1303 0201 | HORIZONTAL BLINDS | SF | 403.000 | 403.000 |
| 1304 | SPECIAL CONSTRUCTION | SF | 21,058.000 | 21,058.000 |

* END OF REPORT *

GENERIC NURSING HOME MODEL, COMPUTER OUTPUT-SYSTEMS LEVEL, PROJECT DEFINITON RUN

| SYSTEM DESCRIPTION | $ MAT (000) | $ LAB (000) | $ EQ (000) | $ TOTAL (000) | % TOT | $/FAC QTY | TOT MH | TOT EH |
|---|---|---|---|---|---|---|---|---|
| 01 SUBSTRUCTURE | 58.1 | 32.0 | 4.1 | 94.2 | 7.6% | 4.47 | 2,512 | 788 |
| 02 SUPERSTRUCTURE | 55.2 | 39.8 | 4.3 | 99.3 | 8.0% | 4.72 | 2,942 | 804 |
| 03 ROOFING | 32.7 | 24.4 | 0.7 | 57.8 | 4.7% | 2.74 | 1,752 | 376 |
| 04 EXTERIOR CLOSURE | 97.5 | 74.4 | 1.3 | 173.2 | 13.9% | 8.23 | 5,464 | 992 |
| 05 INTERIOR CONSTRUCTION | 85.9 | 62.9 | 1.4 | 150.2 | 12.1% | 7.13 | 4,090 | 889 |
| 06 INTERIOR FINISHES | 80.6 | 64.7 | 1.1 | 146.4 | 11.8% | 6.95 | 4,501 | 845 |
| 07 SPECIALTIES | 16.1 | 7.5 | 0.2 | 23.8 | 1.9% | 1.13 | 484 | 125 |
| 08 PLUMBING | 84.6 | 57.9 | 1.5 | 144.0 | 11.6% | 6.84 | 3,495 | 1,090 |
| 09 H.V.A.C | 60.8 | 41.3 | 1.0 | 103.1 | 8.3% | 4.90 | 2,408 | 730 |
| 10 SPECIAL MECHANICAL SYSTEMS | 23.8 | 0.5 | 0.0 | 24.3 | 2.0% | 1.16 | 30 | 9 |
| 11 ELECTRICAL | 80.2 | 107.8 | 0.6 | 188.6 | 15.2% | 8.96 | 5,005 | 469 |
| 12 SPECIAL ELECTRICAL SYSTEMS | 16.7 | 18.7 | 0.1 | 35.5 | 2.9% | 1.68 | 866 | 81 |
| 13 EQUIPMENT | 1.2 | 0.1 | 0.0 | 1.3 | 0.1% | 0.06 | 8 | 2 |
| FACILITY TOTAL | 693.3 | 532.0 | 16.4 | 1,241.7 | 100.0% | 58.97 | 33,557 | 7,200 |
| PERCENT OF FACILITY TOTAL | 55.8% | 42.8% | 1.4% | | | | | |

GENERIC NUSING HOME MODEL, COMPUTER OUTPUT-ASSEMBLY LEVEL, PROJECT DEFINITION RUN

| SYSTEM/SUBSYSTEM<br>ASSEMBLY DESCRIPTION | $ MAT (000) | $ LAB (000) | $ EQ (000) | $ TOTAL (000) | % TOT | $/FAC QTY | TOT MH | TOT EH |
|---|---|---|---|---|---|---|---|---|
| SYSTEM 01 SUBSTRUCTURE | | | | | | | | |
| SUBSYSTEM 01 STANDARD FOUNDATION | | | | | | | | |
| ASSEMBLY 0102/00 1' X 2' STRIP FOOTING, 3,000 PSI | 3.2 | 2.0 | 0.1 | 5.3 | 10.3% | 0.25 | 154 | 38 |
| ASSEMBLY 0103/00 1'0" X 3'0" STRIP FOOTING 3000 PSI | 13.9 | 7.0 | 0.5 | 21.4 | 41.6% | 1.02 | 564 | 144 |
| ASSEMBLY 0131/00 15" THICK CONRETE FOUNDATION WALL 4000 PSI, 16" DEEP | 11.9 | 8.3 | 0.8 | 21.0 | 40.9% | 1.00 | 669 | 193 |
| ASSEMBLY 0201/00 SPREAD FOOTING | 0.8 | 0.2 | 0.0 | 1.0 | 1.9% | 0.05 | 20 | 7 |
| ASSEMBLY 0241/00 SPREAD FTG, REINFORCING STEEL | 0.4 | 0.2 | 0.0 | 0.6 | 1.2% | 0.03 | 13 | 2 |
| ASSEMBLY 0277/00 SPREAD FTG COL BOLTS | 0.3 | 1.7 | 0.0 | 2.0 | 3.9% | 0.09 | 106 | 28 |
| SUBSYSTEM 01 TOTAL | 30.5 | 19.4 | 1.5 | 51.4 | 54.6% | 2.44 | 1,525 | 413 |
| PERCENT OF SUBSYSTEM TOTAL | 59.3% | 37.7% | 3.0% | | | | | |
| SYSTEM 01 SUBSTRUCTURE | | | | | | | | |
| SUBSYSTEM 03 SLAB ON GRADE | | | | | | | | |
| ASSEMBLY 0102/00 5" STANDARD SLAB ON GRADE | 27.6 | 12.6 | 2.5 | 42.7 | 100.0% | 2.03 | 988 | 375 |
| SUBSYSTEM 03 TOTAL | 27.6 | 12.6 | 2.5 | 42.7 | 45.3% | 2.03 | 988 | 375 |
| PERCENT OF SUBSYSTEM TOTAL | 64.6% | 29.5% | 5.9% | | | | | |
| SYSTEM 01 TOTAL | 58.1 | 32.0 | 4.1 | 94.2 | 7.6% | 4.47 | 2,512 | 788 |
| PERCENT OF SYSTEM TOTAL | 61.7% | 34.0% | 4.3% | | | | | |
| SYSTEM 02 SUPERSTRUCTURE | | | | | | | | |
| SUBSYSTEM 02 ROOF CONSTRUCTION | | | | | | | | |
| ASSEMBLY 0130/00 WOOD TRUSS ROOF FRAMING W/ 3/4" PLYWD ROOF DECK | 38.8 | 20.5 | 4.0 | 63.3 | 63.7% | 3.01 | 1,378 | 562 |
| ASSEMBLY 0203/00 8" INTERIOR LOAD BRG CONCRETE MASONRY UNIT WALL | 16.4 | 19.3 | 0.3 | 36.0 | 36.3% | 1.71 | 1,564 | 243 |
| SUBSYSTEM 02 TOTAL | 55.2 | 39.8 | 4.3 | 99.3 | 100.0% | 4.72 | 2,942 | 804 |
| PERCENT OF SUBSYSTEM TOTAL | 55.6% | 40.1% | 4.3% | | | | | |
| SYSTEM 02 TOTAL | 55.2 | 39.8 | 4.3 | 99.3 | 8.0% | 4.72 | 2,942 | 804 |
| PERCENT OF SYSTEM TOTAL | 55.6% | 40.1% | 4.3% | | | | | |

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GENERIC NUSING HOME MODEL, COMPUTER OUTPUT-ASSEMBLY LEVEL, PROJECT DEFINITION RUN

| SYSTEM/SUBSYSTEM ASSEMBLY DESCRIPTION | $ MAT (000) | $ LAB (000) | $ EQ (000) | $ TOTAL (000) | % TOT | $/FAC QTY | TOT MH | TOT EH |
|---|---|---|---|---|---|---|---|---|
| SYSTEM 03 ROOFING | | | | | | | | |
| SUBSYSTEM 01 ROOFING | | | | | | | | |
| ASSEMBLY 0105/00 STRIP SHINGLES, 4" SLOPE, MULTI-LAYERED, CLASS A | 5.6 | 4.9 | 0.0 | 10.5 | 18.2% | 0.50 | 406 | 65 |
| ASSEMBLY 0307/00 1" RIGID INSULATION (2 LAYERS) | 11.1 | 6.9 | 0.2 | 18.2 | 31.5% | 0.87 | 557 | 89 |
| ASSEMBLY 0405/00 MISC. ROOFING ITEMS - 12" GRAVEL STOP | 16.0 | 12.6 | 0.4 | 29.0 | 50.2% | 1.38 | 789 | 222 |
| SUBSYSTEM 01 TOTAL | 32.7 | 24.4 | 0.7 | 57.8 | 100.0% | 2.74 | 1,752 | 376 |
| PERCENT OF SUBSYSTEM TOTAL | 56.6% | 42.2% | 1.2% | | | | | |
| SYSTEM 03 TOTAL | 32.7 | 24.4 | 0.7 | 57.8 | 4.7% | 2.74 | 1,752 | 376 |
| PERCENT OF SYSTEM TOTAL | 56.6% | 42.2% | 1.2% | | | | | |
| SYSTEM 04 EXTERIOR CLOSURE | | | | | | | | |
| SUBSYSTEM 01 EXTERIOR WALLS | | | | | | | | |
| ASSEMBLY 0110/00 8" LOAD BEARING CONCRETE BLOCK EXTERIOR CLOSURE WALL | 39.6 | 36.4 | 0.5 | 76.5 | 53.7% | 3.63 | 2,904 | 488 |
| ASSEMBLY 0201/00 POLYSTYRENE RIGID WALL INSULATION, 1" THICK | 3.8 | 2.6 | 0.0 | 6.4 | 4.5% | 0.30 | 160 | 40 |
| ASSEMBLY 0301/00 3 5/8" MTL. STUD NON-LOAD BEARING INTERIOR SKIN | 7.6 | 12.7 | 0.4 | 20.7 | 14.5% | 0.98 | 673 | 157 |
| ASSEMBLY 0304/00 REINFORCED 8" CONCRETE MASONRY UNIT BACK-UP WALL | 4.0 | 5.1 | 0.1 | 9.2 | 6.5% | 0.44 | 414 | 65 |
| ASSEMBLY 0501/00 FIXED BLADE EXTERIOR LOUVER WITH BAKED ENAMEL FINISH | 1.7 | 1.9 | 0.0 | 3.6 | 2.5% | 0.18 | 104 | 29 |
| ASSEMBLY 0701/00 9" SOLID BRICK RAILING 3'-8" HIGH | 3.5 | 5.6 | 0.1 | 9.2 | 6.5% | 0.44 | 444 | 70 |
| ASSEMBLY 0702/00 3'-8" HIGH - 2" DIA WELDED PIPE RAILING | 10.2 | 0.8 | 0.1 | 11.1 | 7.8% | 0.53 | 51 | 20 |
| ASSEMBLY 0801/00 GYPSUM PLASTER EXTERIOR SOFFITS | 2.9 | 2.6 | 0.1 | 5.6 | 3.9% | 0.26 | 195 | 54 |
| SUBSYSTEM 01 TOTAL | 73.4 | 67.8 | 1.2 | 142.4 | 82.2% | 6.76 | 4,943 | 923 |
| PERCENT OF SUBSYSTEM TOTAL | 51.5% | 47.6% | 0.9% | | | | | |
| SYSTEM 04 EXTERIOR CLOSURE | | | | | | | | |
| SUBSYSTEM 02 EXTERIOR DOORS | | | | | | | | |
| ASSEMBLY 0104/00 6'-0" X 7'-0" ALUMINUM AND GLASS DOOR WITH TRANSOM | 9.9 | 2.1 | 0.0 | 12.0 | 90.2% | 0.57 | 112 | 26 |

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GENERIC NUSING HOME MODEL, COMPUTER OUTPUT-ASSEMBLY LEVEL, PROJECT DEFINITION RUN

| SYSTEM/SUBSYSTEM ASSEMBLY DESCRIPTION | $ MAT (000) | $ LAB (000) | $ EQ (000) | $ TOTAL (000) | % TOT | $/FAC QTY | TOT MH | TOT EH |
|---|---|---|---|---|---|---|---|---|
| ASSEMBLY 0201/00 3'0" X 7'0" HOLLOW METAL DOOR | 0.9 | 0.4 | 0.0 | 1.3 | 9.8% | 0.06 | 25 | 6 |
| SUBSYSTEM 02 TOTAL | 10.8 | 2.4 | 0.1 | 13.3 | 7.7% | 0.63 | 137 | 32 |
| PERCENT OF SUBSYSTEM TOTAL | 81.2% | 18.0% | 0.8% | | | | | |
| SYSTEM 04 EXTERIOR CLOSURE | | | | | | | | |
| SUBSYSTEM 03 EXTERIOR WINDOWS | | | | | | | | |
| ASSEMBLY 0110/00 ALUMINUM FRM SLIDING TYPE WINDOW - 3/8" BRONZE | 13.4 | 4.2 | 0.0 | 17.6 | 100.0% | 0.84 | 384 | 37 |
| SUBSYSTEM 03 TOTAL | 13.4 | 4.2 | 0.0 | 17.6 | 10.2% | 0.84 | 384 | 37 |
| PERCENT OF SUBSYSTEM TOTAL | 76.1% | 23.9% | 0.0% | | | | | |
| SYSTEM 04 TOTAL | 97.5 | 74.4 | 1.3 | 173.2 | 13.9% | 8.23 | 5,464 | 992 |
| PERCENT OF SYSTEM TOTAL | 56.3% | 43.0% | 0.7% | | | | | |
| SYSTEM 05 INTERIOR CONSTRUCTION | | | | | | | | |
| SUBSYSTEM 01 PARTITIONS | | | | | | | | |
| ASSEMBLY 0101/00 NON-LOAD BRG PARTITION - 16" O.C. | 3.3 | 4.7 | 0.1 | 8.1 | 10.2% | 0.39 | 273 | 62 |
| ASSEMBLY 0102/00 NON-LOAD BRG PARTITION - 24" O.C. | 14.5 | 20.0 | 0.5 | 35.0 | 44.0% | 1.66 | 1,161 | 263 |
| ASSEMBLY 0105/00 MTL STUD PARTITION 4" - 1/2" GYP BD EACH SIDE | 0.6 | 0.9 | 0.0 | 1.5 | 1.9% | 0.07 | 52 | 12 |
| ASSEMBLY 0106/00 MTL STUD PARTITION 4" - 1/2" GYP BD EA SIDE SOUND RATED | 4.6 | 7.7 | 0.2 | 12.5 | 15.7% | 0.59 | 468 | 111 |
| ASSEMBLY 0111/00 NON-LOAD BRG PARTITION OF 8 X 4 X 16 CONCRETE | 2.1 | 4.0 | 0.1 | 6.2 | 7.8% | 0.29 | 316 | 50 |
| ASSEMBLY 0112/00 NON-LOAD BRG PARTITION OF 8 X 6 X 16 CONCRETE | 0.4 | 1.0 | 0.0 | 1.4 | 1.8% | 0.07 | 77 | 12 |
| ASSEMBLY 0113/00 NON-LOAD BRG PARTITION OF 8 X 8 X 16 CONCRETE | 3.5 | 6.8 | 0.1 | 10.4 | 13.1% | 0.49 | 548 | 86 |
| ASSEMBLY 0119/00 8 X 12 X 16 LOAD BRG REINFORCED CONC. MASONRY UNIT WALL | 0.4 | 0.4 | 0.0 | 0.8 | 1.0% | 0.04 | 23 | 4 |
| ASSEMBLY 0401/00 ALUMINUM BALCONY RAIL | 3.7 | 0.3 | 0.0 | 4.0 | 5.0% | 0.19 | 19 | 8 |
| SUBSYSTEM 01 TOTAL | 32.9 | 45.6 | 1.0 | 79.5 | 52.9% | 3.78 | 2,938 | 606 |
| PERCENT OF SUBSYSTEM TOTAL | 41.4% | 57.4% | 1.2% | | | | | |

SYSTEM 05 INTERIOR CONSTRUCTION
SUBSYSTEM 02 INTERIOR DOORS

[> CONTINUED NEXT PAGE <]

GENERIC NUSING HOME MODEL, COMPUTER OUTPUT ASSEMBLY LEVEL, PROJECT DEFINITION RUN

| SYSTEM/SUBSYSTEM ASSEMBLY DESCRIPTION | $ MAT (000) | $ LAB (000) | $ EQ (000) | $ TOTAL (000) | % TOT | $/FAC QTY | TOT MH | TOT EH |
|---|---|---|---|---|---|---|---|---|
| ASSEMBLY 0101/00 3'-0" X 7'-0" HOLLOW METAL DOOR | 8.5 | 3.9 | 0.1 | 12.5 | 19.1% | 0.59 | 273 | 67 |
| ASSEMBLY 0104/00 3'0" X 7'0" HOLLOW METAL DOOR W/CLOSURE | 0.9 | 0.4 | 0.0 | 1.3 | 2.0% | 0.06 | 28 | 7 |
| ASSEMBLY 0108/00 4'-0" X 7'-0" HOLLOW METAL DOOR | 0.4 | 0.2 | 0.0 | 0.6 | 0.9% | 0.03 | 13 | 3 |
| ASSEMBLY 0109/00 4'0" X 8'0" HOLLOW METAL DOOR | 2.4 | 0.5 | 0.0 | 2.9 | 4.4% | 0.14 | 33 | 9 |
| ASSEMBLY 0111/00 8'-0" X 7'-0" PAIR HOLLOW METAL DOORS | 0.8 | 0.3 | 0.0 | 1.1 | 1.7% | 0.05 | 23 | 5 |
| ASSEMBLY 0117/00 3'-0" X 7'-0" WOOD DOOR, HM FRM | 25.8 | 8.3 | 0.2 | 34.3 | 52.5% | 1.63 | 525 | 138 |
| ASSEMBLY 0118/00 4'-0" X 7'-0" WOOD DOOR, HM FRM | 0.4 | 0.1 | 0.0 | 0.5 | 0.8% | 0.02 | 7 | 2 |
| ASSEMBLY 0119/00 6'-0" X 7'-0" PAIR WOOD DOORS, HM FRM | 0.7 | 0.2 | 0.0 | 0.9 | 1.4% | 0.04 | 12 | 3 |
| ASSEMBLY 0204/00 6'-0" X 7'-0" ALUMINUM AND GLASS DOOR WITH TRANSOM | 3.3 | 0.7 | 0.0 | 4.0 | 6.1% | 0.19 | 37 | 9 |
| ASSEMBLY 0401/00 3'-0" X 7'-0" FIRE RATED HOLLOW METAL DOOR | 0.4 | 0.2 | 0.0 | 0.6 | 0.9% | 0.03 | 13 | 3 |
| ASSEMBLY 0402/00 6'-0" X 7'-0" PAIR FIRE RATED HOLLOW METAL DOORS | 2.4 | 0.9 | 0.0 | 3.3 | 5.1% | 0.16 | 68 | 16 |
| ASSEMBLY 0405/00 3'-0" X 7'-0" FIRE RATED WOOD DOOR | 0.9 | 0.2 | 0.0 | 1.1 | 1.7% | 0.06 | 15 | 4 |
| ASSEMBLY 0406/00 6'-0" X 7'-0" PAIR FIRE RATED WOOD DOORS | 1.7 | 0.4 | 0.0 | 2.1 | 3.2% | 0.10 | 25 | 6 |
| SUBSYSTEM 02 TOTAL | 48.6 | 16.3 | 0.4 | 65.3 | 43.5% | 3.10 | 1,071 | 273 |
| PERCENT OF SUBSYSTEM TOTAL | 74.4% | 25.0% | 0.6% | | | | | |
| SYSTEM 05 INTERIOR CONSTRUCTION | | | | | | | | |
| SUBSYSTEM 03 INTERIOR WINDOWS | | | | | | | | |
| ASSEMBLY 0102/00 FIXED TYPE WINDOW WITH ALUMINUM FRM - 1/4 CLEAR GLASS | 1.7 | 0.4 | 0.0 | 2.1 | 42.0% | 0.10 | 34 | 3 |
| ASSEMBLY 0104/00 FIXED TYPE WINDOW WITH ALUMINUM FRM - 3/4" CLEAR GLASS | 0.1 | 0.0 | 0.0 | 0.1 | 2.0% | 0.00 | 1 | 0 |
| ASSEMBLY 0201/00 STOREFRONT WITH LT ALUMINUM FRM- 3/8" CLEAR GLASS | 2.3 | 0.6 | 0.0 | 2.9 | 58.0% | 0.14 | 46 | 7 |
| SUBSYSTEM 03 TOTAL | 4.0 | 1.0 | 0.0 | 5.0 | 3.3% | 0.24 | 80 | 10 |
| PERCENT OF SUBSYSTEM TOTAL | 80.0% | 20.0% | 0.0% | | | | | |

SYSTEM 05 INTERIOR CONSTRUCTION
SUBSYSTEM 04 INTERIOR OVERHEAD AND SPECIAL DOORS

[> CONTINUED NEXT PAGE <]

GENERIC NUSING HOME MODEL, COMPUTER OUTPUT-ASSEMBLY LEVEL, PROJECT DEFINITION RUN

| SYSTEM/SUBSYSTEM ASSEMBLY DESCRIPTION | $ MAT (000) | $ LAB (000) | $ EQ (000) | $ TOTAL (000) | % TOT | $/FAC QTY | TOT MH | TOT EH |
|---|---|---|---|---|---|---|---|---|
| ASSEMBLY 0212/00 4 FT X 4 FT ALUMINUM ROLL UP GRILLE, MANUALLY OPERATED | 0.4 | 0.0 | 0.0 | 0.4 | 100.0% | 0.02 | 2 | 0 |
| SUBSYSTEM 04 TOTAL | 0.4 | 0.0 | 0.0 | 0.4 | 0.3% | 0.02 | 2 | 0 |
| PERCENT OF SUBSYSTEM TOTAL | 100.0% | 0.0% | 0.0% | | | | | |
| SYSTEM 05 TOTAL | 85.9 | 62.9 | 1.4 | 150.2 | 12.1% | 7.13 | 4,090 | 889 |
| PERCENT OF SYSTEM TOTAL | 57.2% | 41.9% | 0.9% | | | | | |
| SYSTEM 06 INTERIOR FINISHES | | | | | | | | |
| SUBSYSTEM 01 WALL FINISHES | | | | | | | | |
| ASSEMBLY 0201/00 2 COATS OF GYPSUM PLASTER ON 3/8" GYPSUM LATH | 7.3 | 4.1 | 0.1 | 11.5 | 20.8% | 0.54 | 327 | 94 |
| ASSEMBLY 0301/00 5/8" GYPSUM BOARD ON 7/8" FURRING CHANNEL | 6.7 | 9.9 | 0.2 | 16.8 | 30.4% | 0.80 | 626 | 159 |
| ASSEMBLY 0303/00 TWO LAYERS OF 5/8" FIRE RESISTANT GYPSUM BOARD | 0.2 | 0.2 | 0.0 | 0.4 | 0.7% | 0.02 | 10 | 3 |
| ASSEMBLY 0401/00 4-1/4" X 4-1/4" CERAMIC TILE TO WALLS | 8.1 | 5.7 | 0.0 | 13.8 | 25.0% | 0.66 | 328 | 42 |
| ASSEMBLY 0501/00 PAINT TO GYPSUM BOARD WALLS USING ROLLER | 1.2 | 1.8 | 0.0 | 3.0 | 5.4% | 0.14 | 164 | 35 |
| ASSEMBLY 0502/00 PAINT TO CONCRETE BLOCK USING BRUSHES, TWO COATS | 0.5 | 1.7 | 0.1 | 2.3 | 4.2% | 0.10 | 144 | 31 |
| ASSEMBLY 0506/00 EPOXY PAINT TO DRYWALL | 0.5 | 1.0 | 0.0 | 1.5 | 2.7% | 0.07 | 83 | 18 |
| ASSEMBLY 0601/00 LIGHT WEIGHT VINYL WALLCOVERING WITH FABRIC BACKING | 0.0 | 0.0 | 0.0 | 0.0 | 0.0% | 0.00 | 1 | 0 |
| ASSEMBLY 0602/00 MEDIUM WEIGHT VINYL WALLCOVERING WITH FABRIC BACKING | 4.2 | 1.7 | 0.0 | 5.9 | 10.7% | 0.28 | 143 | 14 |
| ASSEMBLY 0701/00 4' X 8' X 1" FIBERGLASS SOUND ABSORBING PANELS | 0.0 | 0.0 | 0.0 | 0.0 | 0.0% | 0.00 | 0 | 0 |
| ASSEMBLY 0804/00 MATT FINISH LIQUID GLAZED WALL COATING | 0.0 | 0.0 | 0.0 | 0.0 | 0.0% | 0.00 | 1 | 0 |
| SUBSYSTEM 01 TOTAL | 28.6 | 26.1 | 0.5 | 55.2 | 37.7% | 2.62 | 1,826 | 396 |
| PERCENT OF SUBSYSTEM TOTAL | 51.8% | 47.3% | 0.9% | | | | | |
| SYSTEM 06 INTERIOR FINISHES | | | | | | | | |
| SUBSYSTEM 02 FLOORING & FLOOR FINISHES | | | | | | | | |
| ASSEMBLY 0101/00 THIN SET NATURAL CLAY CERAMIC TILE FLOOR AND BASE | 13.0 | 8.5 | 0.1 | 21.6 | 41.5% | 1.03 | 489 | 62 |
| ASSEMBLY 0102/00 6" X 6" X 1/2" MUD SET QUARRY TILE AND BASE | 0.9 | 1.1 | 0.0 | 2.0 | 3.8% | 0.10 | 66 | 8 |

[> CONTINUED NEXT PAGE <]

GENERIC NUSING HOME MODEL, COMPUTER OUTPUT-ASSEMBLY LEVEL, PROJECT DEFINITION RUN

| SYSTEM/SUBSYSTEM ASSEMBLY DESCRIPTION | $ MAT (000) | $ LAB (000) | $ EQ (000) | $ TOTAL (000) | % TOT | $/FAC QTY | TOT MH | TOT EH |
|---|---|---|---|---|---|---|---|---|
| ASSEMBLY 0401/00 VINYL ""LE, 1/8 "X 12" X 12" | 6.9 | 2.1 | 0.0 | 9.0 | 17.3% | 0.43 | 119 | 15 |
| ASSEMBLY 0402/00 VINYL TILE 1/8" TRAVERTINE | 0.2 | 0.1 | 0.0 | 0.3 | 0.6% | 0.01 | 5 | 1 |
| ASSEMBLY 0501/00 COMMERCIAL GRADE 26 OZ. NYLON CARPET | 1.8 | 0.4 | 0.0 | 2.2 | 4.2% | 0.10 | 38 | 4 |
| ASSEMBLY 0502/00 COMMERCIAL GRADE 35 OZ NYLON | 6.7 | 1.3 | 0.0 | 8.0 | 15.4% | 0.38 | 120 | 14 |
| ASSEMBLY 0503/00 COMMERCIAL GRADE 30 OZ. WOOL CARPET | 2.4 | 0.2 | 0.0 | 2.6 | 5.0% | 0.12 | 16 | 2 |
| ASSEMBLY 0601/00 FLOOR PAVERS 8X4, 1" TO 1-1/4" THICK | 2.3 | 3.1 | 0.0 | 5.4 | 10.4% | 0.26 | 231 | 35 |
| ASSEMBLY 0701/00 VINYL PEDESTAL ACCESS FLR W/HANDRAIL | 0.8 | 0.0 | 0.0 | 0.8 | 1.5% | 0.04 | 2 | 0 |
| ASSEMBLY 0903/00 FLOOR HARDENER, NON-METALLIC LIGHT SERVICE | 0.0 | 0.1 | 0.0 | 0.1 | 0.2% | 0.00 | 4 | 1 |
| SUBSYSTEM 02 TOTAL | 35.0 | 16.9 | 0.2 | 52.1 | 35.6% | 2.47 | 1,090 | 143 |
| PERCENT OF SUBSYSTEM TOTAL | 67.2% | 32.4% | 0.4% | | | | | |
| SYSTEM 06 INTERIOR FINISHES | | | | | | | | |
| SUBSYSTEM 03 CEILING & CEILING FINISHES | | | | | | | | |
| ASSEMBLY 0101/00 EXPOSED CONCRETE FINISH | 0.6 | 5.5 | 0.1 | 6.2 | 15.8% | 0.29 | 432 | 55 |
| ASSEMBLY 0301/00 5/8" GYPSUM WALL BOARD CEILING, 1 LAYER, FIRE RATED | 1.4 | 1.8 | 0.0 | 3.2 | 8.2% | 0.15 | 90 | 22 |
| ASSEMBLY 0302/00 5/8" GYPSUM WALLBOARD CEILING, 3 LAYERS, OVER 8 FT. | 1.0 | 1.4 | 0.0 | 2.4 | 6.1% | 0.11 | 58 | 15 |
| ASSEMBLY 0402/00 2' X 2' OR 2' X 4' FIBERGLASS ACOUSTICAL CEILING TILES | 2.8 | 1.3 | 0.0 | 4.1 | 10.5% | 0.19 | 81 | 20 |
| ASSEMBLY 0601/00 PAINTING TO DRYWALL OR PLASTER USING ROLLERS, 2 COATS | 0.1 | 0.2 | 0.0 | 0.3 | 0.8% | 0.02 | 18 | 4 |
| ASSEMBLY 0603/00 PAINT EXPOSED STEEL JOISTS AND ROOF DECK | 0.1 | 0.2 | 0.0 | 0.3 | 0.8% | 0.02 | 20 | 4 |
| ASSEMBLY 0702/00 T-BAR CEILING SUSPENSION SYSTEM 2' X 2' GRID | 1.9 | 0.8 | 0.0 | 2.7 | 6.9% | 0.13 | 53 | 13 |
| ASSEMBLY 0703/00 T-BAR CEILING SUSPENSION SYSTEM 2' X 4' GRID | 1.6 | 0.6 | 0.0 | 2.2 | 5.6% | 0.11 | 40 | 10 |
| ASSEMBLY 0704/00 SUSPENSION SYSTEM FOR GYPSUM BOARD CEILING | 3.9 | 9.4 | 0.2 | 13.5 | 34.4% | 0.64 | 755 | 151 |
| ASSEMBLY 0902/00 EXTERIOR CANOPY W/FRAMING | 3.5 | 0.6 | 0.1 | 4.2 | 10.7% | 0.20 | 38 | 12 |
| SUBSYSTEM 03 TOTAL | 16.9 | 21.8 | 0.5 | 39.2 | 26.8% | 1.86 | 1,584 | 307 |
| PERCENT OF SUBSYSTEM TOTAL | 43.1% | 55.6% | 1.3% | | | | | |

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GENERIC NUSING HOME MODEL, COMPUTER OUTPUT-ASSEMBLY LEVEL, PROJECT DEFINITION RUN

| SYSTEM/SUBSYSTEM ASSEMBLY DESCRIPTION | $ MAT (000) | $ LAB (000) | $ EQ (000) | $ TOTAL (000) | % TOT | $/FAC QTY | TOT MH | TOT EH |
|---|---|---|---|---|---|---|---|---|
| SYSTEM 06 TOTAL | 80.6 | 64.7 | 1.1 | 146.4 | 11.8% | 6.95 | 4,501 | 845 |
| PERCENT OF SYSTEM TOTAL | 55.1% | 44.2% | 0.7% | | | | | |
| SYSTEM 07 SPECIALTIES | | | | | | | | |
| SUBSYSTEM 01 GENERAL SPECIALTIES | | | | | | | | |
| ASSEMBLY 0101/00 URINAL SCREENS | 0.1 | 0.0 | 0.0 | 0.1 | 0.7% | 0.01 | 2 | 1 |
| ASSEMBLY 0102/00 TOILET PARTITION AND ACCESSORIES | 1.7 | 0.3 | 0.0 | 2.0 | 13.2% | 0.09 | 16 | 4 |
| ASSEMBLY 0103/00 TOILET PARTITIONS - PORCELAIN ENAMELED STEEL, WALL HUNG | 0.3 | 0.2 | 0.0 | 0.5 | 3.3% | 0.02 | 3 | 1 |
| ASSEMBLY 0106/00 LAVORATORY ACCESSORIES | 0.6 | 0.1 | 0.0 | 0.7 | 4.6% | 0.03 | 4 | 1 |
| ASSEMBLY 0201/00 TOILET PAPER HOLDER | 0.0 | 0.0 | 0.0 | 0.0 | 0.0% | 0.00 | 0 | 0 |
| ASSEMBLY 0202/00 SANITARY NAPKIN DISPENSER | 0.2 | 0.0 | 0.0 | 0.2 | 1.3% | 0.01 | 2 | 0 |
| ASSEMBLY 0203/00 PAPER TOWEL DISPENSER AND WASTE RECEPTACLE | 0.3 | 0.0 | 0.0 | 0.3 | 2.0% | 0.01 | 1 | 0 |
| ASSEMBLY 0206/00 GRAB BARS | 0.0 | 0.0 | 0.0 | 0.0 | 0.0% | 0.00 | 1 | 0 |
| ASSEMBLY 0207/00 BATH ROOM MIRRORS | 0.1 | 0.0 | 0.0 | 0.1 | 0.7% | 0.00 | 1 | 0 |
| ASSEMBLY 0209/00 SANITARY NAPKIN AND TAMPON RECEPTACLE | 0.1 | 0.0 | 0.0 | 0.1 | 0.7% | 0.00 | 1 | 0 |
| ASSEMBLY 0210/00 SOAP DISPENSER | 0.0 | 0.0 | 0.0 | 0.0 | 0.0% | 0.00 | 1 | 0 |
| ASSEMBLY 0213/00 ACCESSORIES FOR TYPICAL ENLISTED OR OFFICER DORM UNIT | 3.6 | 2.3 | 0.0 | 5.9 | 39.1% | 0.29 | 168 | 32 |
| ASSEMBLY 0301/00 PORCELAIN ENAMEL CHALKBOARD | 0.0 | 0.0 | 0.0 | 0.0 | 0.0% | 0.00 | 2 | 1 |
| ASSEMBLY 0403/00 BRONZE LETTERS WITH SATIN FINISH 8" HIGH | 0.1 | 0.0 | 0.0 | 0.1 | 0.7% | 0.00 | 2 | 1 |
| ASSEMBLY 0406/00 ALUMINUM FRAMED GLASS COVERED DIRECTORY BOARD | 0.0 | 0.0 | 0.0 | 0.0 | 0.0% | 0.00 | 2 | 0 |
| ASSEMBLY 0601/00 10" WIDE STOCK PREFINISHED SHELVES WITH SUPPORTS | 2.7 | 2.1 | 0.1 | 4.9 | 32.5% | 0.24 | 135 | 47 |
| SUBSYSTEM 01 TOTAL | 9.7 | 5.2 | 0.2 | 15.1 | 63.4% | 0.72 | 342 | 88 |
| PERCENT OF SUBSYSTEM TOTAL | 64.2% | 34.4% | 1.4% | | | | | |

SYSTEM 07 SPECIALTIES
  SUBSYSTEM 02 BUILT-IN SPECIALTIES

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GENERIC NUSING HOME MODEL, COMPUTER OUTPUT-ASSEMBLY LEVEL, PROJECT DEFINITION RUN

| SYSTEM/SUBSYSTEM ASSEMBLY DESCRIPTION | $ MAT (000) | $ LAB (000) | $ EQ (000) | $ TOTAL (000) | % TOT | $/FAC QTY | TOT MH | TOT EH |
|---|---|---|---|---|---|---|---|---|
| ASSEMBLY 0101/00 PLASTIC LAMINATE COUNTERTOP WITH BACKSPLASH | 0.6 | 0.0 | 0.0 | 0.6 | 7.0% | 0.03 | 2 | 1 |
| ASSEMBLY 0201/00 PLASTIC LAMINATE CABINETS WITH COUNTERTOP AND DRAWERS | 0.2 | 0.0 | 0.0 | 0.2 | 2.3% | 0.01 | 1 | 0 |
| ASSEMBLY 0202/00 CUSTOM BATHRM VANITY - PREFINISHED W/PLASTIC LAM TOP | 4.3 | 1.8 | 0.0 | 6.1 | 70.9% | 0.29 | 115 | 30 |
| ASSEMBLY 0203/00 KTCHN CAB. - PREFINISHED HARDWD W/PLASTIC LAMINATE TOP | 0.8 | 0.3 | 0.0 | 1.1 | 12.8% | 0.05 | 17 | 4 |
| ASSEMBLY 0204/00 BATHROOM VANITY 30" WIDE X 24" DEEP X 34" HIGH | 0.1 | 0.0 | 0.0 | 0.1 | 1.2% | 0.01 | 2 | 1 |
| ASSEMBLY 0210/00 METAL BASE AND WALL CABINETS | 0.1 | 0.0 | 0.0 | 0.1 | 1.2% | 0.01 | 2 | 1 |
| ASSEMBLY 0501/00 FIRE EXTINGUISHER CABINET, 8" X 12" X 27" | 0.2 | 0.0 | 0.0 | 0.2 | 2.3% | 0.01 | 2 | 1 |
| SUBSYSTEM 02 TOTAL | 6.4 | 2.2 | 0.0 | 8.6 | 36.1% | 0.41 | 142 | 37 |
| PERCENT OF SUBSYSTEM TOTAL | 74.4% | 25.6% | 0.0% | | | | | |
| SYSTEM 07 TOTAL | 16.1 | 7.5 | 0.2 | 23.8 | 1.9% | 1.13 | 434 | 125 |
| PERCENT OF SYSTEM TOTAL | 67.6% | 31.5% | 0.9% | | | | | |
| SYSTEM 08 PLUMBING | | | | | | | | |
| SUBSYSTEM 01 DOMESTIC WATER SUPPLY | | | | | | | | |
| ASSEMBLY 0101/00 COPPER PIPE & FITTINGS | 21.9 | 24.5 | 0.7 | 47.1 | 72.9% | 2.23 | 1,345 | 507 |
| ASSEMBLY 0201/00 VALVES & HYDRANTS | 2.1 | 0.7 | 0.0 | 2.8 | 4.3% | 0.13 | 35 | 9 |
| ASSEMBLY 0306/00 DOMESTIC HOT WATER HEATERS | 3.7 | 0.4 | 0.0 | 4.1 | 6.3% | 0.20 | 24 | 7 |
| ASSEMBLY 0401/00 FIBERGLASS 1-1/2" PIPE INSULATION WITH VAPOR BARRIER | 7.7 | 2.8 | 0.1 | 10.6 | 16.4% | 0.50 | 247 | 67 |
| SUBSYSTEM 01 TOTAL | 35.4 | 28.4 | 0.8 | 64.6 | 44.9% | 3.07 | 1,651 | 591 |
| PERCENT OF SUBSYSTEM TOTAL | 54.8% | 44.0% | 1.2% | | | | | |
| SYSTEM 08 PLUMBING | | | | | | | | |
| SUBSYSTEM 02 SANITARY WASTE & VENT SYSTEM | | | | | | | | |
| ASSEMBLY 0101/00 WASTE PIPE & FITTINGS ORDINARY FAC. | 10.5 | 9.9 | 0.2 | 20.6 | 80.2% | 0.98 | 610 | 164 |
| ASSEMBLY 0201/00 C.I. NO HUB VENT PIPE SYSTM | 2.1 | 2.7 | 0.1 | 4.9 | 19.1% | 0.23 | 166 | 45 |
| ASSEMBLY 0304/00 MEDIUM DUTY AND HEAVY DUTY CAST IRON FLOOR DRAINS, ADTL | 0.1 | 0.1 | 0.0 | 0.2 | 0.8% | 0.01 | 8 | 2 |

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GENERIC NUSING HOME MODEL, COMPUTER OUTPUT-ASSEMBLY LEVEL, PROJECT DEFINITION RUN

| SYSTEM/SUBSYSTEM ASSEMBLY DESCRIPTION | $ MAT (000) | $ LAB (000) | $ EQ (000) | $ TOTAL (000) | % TOT | $/FAC QTY | TOT MH | TOT EH |
|---|---|---|---|---|---|---|---|---|
| SUBSYSTEM 02 TOTAL | 12.7 | 12.7 | 0.3 | 25.7 | 17.8% | 1.22 | 784 | 210 |
| PERCENT OF SUBSYSTEM TOTAL | 49.4% | 49.4% | 1.2% | | | | | |
| SYSTEM 08 PLUMBING | | | | | | | | |
| SUBSYSTEM 03 RAINWATER DRAINAGE SYSTEM | | | | | | | | |
| ASSEMBLY 0101/00 RAINWATER DRAINAGE PIPING | 6.3 | 4.7 | 0.1 | 11.1 | 77.6% | 0.53 | 287 | 81 |
| ASSEMBLY 0203/00 4" TO 3" CAST IRON ROOF DRAINS WITH ALUMINUM DOME | 2.5 | 0.7 | 0.0 | 3.2 | 22.4% | 0.16 | 45 | 12 |
| SUBSYSTEM 03 TOTAL | 8.8 | 5.4 | 0.1 | 14.3 | 9.9% | 0.68 | 333 | 94 |
| PERCENT OF SUBSYSTEM TOTAL | 61.5% | 37.8% | 0.7% | | | | | |
| SYSTEM 08 PLUMBING | | | | | | | | |
| SUBSYSTEM 04 PLUMBING FIXTURES | | | | | | | | |
| ASSEMBLY 0101/00 FLOOR MOUNTED - WATER CLOSET | 1.9 | 1.1 | 0.0 | 3.0 | 7.6% | 0.14 | 67 | 18 |
| ASSEMBLY 0103/00 ELONGATED, FLOOR MOUNTED WATER CLOSET | 0.8 | 0.3 | 0.0 | 1.1 | 2.8% | 0.05 | 17 | 4 |
| ASSEMBLY 0203/00 WALL MOUNTED - URINAL, WASH DOWN TYPE | 0.4 | 0.1 | 0.0 | 0.5 | 1.3% | 0.02 | 5 | 1 |
| ASSEMBLY 0204/00 WHITE CHINA URINAL - WALL HUNG | 0.5 | 0.2 | 0.0 | 0.7 | 1.8% | 0.03 | 10 | 3 |
| ASSEMBLY 0304/00 26" BY 18" WHITE OVAL LAVATORY | 4.8 | 1.5 | 0.0 | 6.3 | 16.0% | 0.30 | 94 | 25 |
| ASSEMBLY 0306/00 VITREOUS CHINA WALL HUNG LAVATORY WITH ROUGH-IN | 0.9 | 0.5 | 0.0 | 1.4 | 3.6% | 0.07 | 33 | 9 |
| ASSEMBLY 0308/00 CAST IRON, WALLHUNG LAVATORY | 0.5 | 0.1 | 0.0 | 0.6 | 1.5% | 0.03 | 8 | 2 |
| ASSEMBLY 0401/00 STAINLESS STEEL - SINGLE BOWL | 0.2 | 0.1 | 0.0 | 0.3 | 0.8% | 0.01 | 4 | 1 |
| ASSEMBLY 0403/00 25" BY 22" SINGLE BOWL KITCHEN SINK OF STAINLESS STEEL | 0.3 | 0.1 | 0.0 | 0.4 | 1.0% | 0.02 | 9 | 2 |
| ASSEMBLY 0404/00 MEDICAL SINKS | 1.1 | 0.5 | 0.0 | 1.6 | 4.1% | 0.08 | 34 | 9 |
| ASSEMBLY 0406/00 SERVICE SINK - ENAMELED CAST IRON | 0.6 | 0.1 | 0.0 | 0.7 | 1.8% | 0.03 | 3 | 1 |
| ASSEMBLY 0407/00 JANITOR SINK - FLOOR TYPE | 1.1 | 0.1 | 0.0 | 1.2 | 3.1% | 0.06 | 9 | 2 |
| ASSEMBLY 0408/00 WALL HUNG 24" BY 20" JANITORS SINK OF PORCELAIN ENAMEL | 1.6 | 0.3 | 0.0 | 1.9 | 4.8% | 0.09 | 16 | 4 |

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GENERIC NUSING HOME MODEL, COMPUTER OUTPUT-ASSEMBLY LEVEL, PROJECT DEFINITION RUN

| SYSTEM/SUBSYSTEM ASSEMBLY DESCRIPTION | $ MAT (000) | $ LAB (000) | $ EQ (000) | $ TOTAL (000) | % TOT | $/FAC QTY | TOT MH | TOT EH |
|---|---|---|---|---|---|---|---|---|
| ASSEMBLY 0502/00 SHOWER VALVE, DRAIN FOR CERAMIC TILE SHOWER | 0.3 | 0.5 | 0.0 | 0.8 | 2.0% | 0.04 | 32 | 8 |
| ASSEMBLY 0504/00 PORCELAIN ENAMEL CAST IRON BATHTUB | 1.0 | 0.4 | 0.0 | 1.4 | 3.6% | 0.07 | 27 | 7 |
| ASSEMBLY 0505/00 PORCELAIN ENAMELED STEEL BATHTUB | 6.4 | 4.7 | 0.1 | 11.2 | 28.5% | 0.53 | 304 | 82 |
| ASSEMBLY 0601/00 8 GPH ELECTIC WATER COOLER - WALL MOUNTED | 0.4 | 0.1 | 0.0 | 0.5 | 1.3% | 0.02 | 4 | 1 |
| ASSEMBLY 0603/00 HANDICAPPED ELECTRIC WATER COOLER, WALL MOUNTED | 0.5 | 0.1 | 0.0 | 0.6 | 1.5% | 0.03 | 4 | 1 |
| ASSEMBLY 0604/00 ELECTRIC WALL HUNG WATER FOUNTAIN | 1.1 | 0.3 | 0.0 | 1.4 | 3.6% | 0.07 | 17 | 5 |
| ASSEMBLY 0606/00 HANDICAPPED TYPE 8 GPM WATER COOLER W/ROUGH IN | 3.2 | 0.5 | 0.0 | 3.7 | 9.4% | 0.18 | 31 | 8 |
| SUBSYSTEM 04 TOTAL | 27.6 | 11.4 | 0.3 | 39.3 | 27.3% | 1.86 | 727 | 195 |
| PERCENT OF SUBSYSTEM TOTAL | 70.2% | 29.0% | 0.8% | | | | | |
| SYSTEM 08 TOTAL | 84.6 | 57.9 | 1.5 | 144.0 | 11.6% | 6.84 | 3,495 | 1,090 |
| PERCENT OF SYSTEM TOTAL | 58.8% | 40.2% | 1.0% | | | | | |
| SYSTEM 09 H.V.A.C | | | | | | | | |
| SUBSYSTEM 01 ENERGY SUPPLY | | | | | | | | |
| ASSEMBLY 0206/00 900 MBH GAS SUPPLY | 1.2 | 0.4 | 0.0 | 1.6 | 100.0% | 0.08 | 26 | 7 |
| SUBSYSTEM 01 TOTAL | 1.2 | 0.4 | 0.0 | 1.6 | 1.6% | 0.08 | 26 | 7 |
| PERCENT OF SUBSYSTEM TOTAL | 75.0% | 25.0% | 0.0% | | | | | |
| SYSTEM 09 H.V.A.C | | | | | | | | |
| SUBSYSTEM 02 HEAT GENERATING SYSTEM | | | | | | | | |
| ASSEMBLY 0216/00 HOT WATER BOILER, GAS FIRED 320 MBH | 7.1 | 2.8 | 0.1 | 10.0 | 100.0% | 0.47 | 164 | 50 |
| SUBSYSTEM 02 TOTAL | 7.1 | 2.8 | 0.1 | 10.0 | 9.7% | 0.47 | 164 | 50 |
| PERCENT OF SUBSYSTEM TOTAL | 71.0% | 28.0% | 1.0% | | | | | |
| SYSTEM 09 H.V.A.C | | | | | | | | |
| SUBSYSTEM 03 COOLING GENERATING SYSTEM | | | | | | | | |
| ASSEMBLY 0102/00 20 TON AIR COOLED RECIP. CHILLER W/MECH. ROOM PIPING | 13.7 | 3.1 | 0.1 | 16.9 | 100.0% | 0.80 | 183 | 63 |

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GENERIC NUSING HOME MODEL, COMPUTER OUTPUT-ASSEMBLY LEVEL, PROJECT DEFINITION RUN

| SYSTEM/SUBSYSTEM ASSEMBLY DESCRIPTION | $ MAT (000) | $ LAB (000) | $ EQ (000) | $ TOTAL (000) | % TOT | $/FAC QTY | TOT MH | TOT EH |
|---|---|---|---|---|---|---|---|---|
| SUBSYSTEM 03 TOTAL | 13.7 | 3.1 | 0.1 | 16.9 | 16.4% | 0.80 | 183 | 63 |
| PERCENT OF SUBSYSTEM TOTAL | 81.1% | 18.3% | 0.6% | | | | | |
| SYSTEM 09 H.V.A.C | | | | | | | | |
| SUBSYSTEM 04 DISTRIBUTION SYSTEMS | | | | | | | | |
| ASSEMBLY 0101/00 .3 MCFM FAN COIL UNIT ASSEMBLY | 16.4 | 6.7 | 0.1 | 23.2 | 45.8% | 1.10 | 373 | 106 |
| ASSEMBLY 0116/00 1.6MCFM AHU WITH HEAT COIL & OUTSIDE AIR INTAKE | 1.1 | 0.3 | 0.0 | 1.4 | 2.8% | 0.07 | 20 | 5 |
| ASSEMBLY 0704/00 CHILLED WATER DISTRIBUTION FOR BOQ (40 TONS 83 UNITS) | 11.6 | 14.0 | 0.4 | 26.0 | 51.3% | 1.23 | 869 | 284 |
| SUBSYSTEM 04 TOTAL | 29.1 | 21.0 | 0.6 | 50.7 | 49.2% | 2.41 | 1,262 | 395 |
| PERCENT OF SUBSYSTEM TOTAL | 57.4% | 41.4% | 1.2% | | | | | |
| SYSTEM 09 H.V.A.C | | | | | | | | |
| SUBSYSTEM 07 SYSTEMS TESTING & BALANCING | | | | | | | | |
| ASSEMBLY 0102/00 WATER TEST & BALANCE BOILER | 0.2 | 0.1 | 0.0 | 0.3 | 2.6% | 0.01 | 7 | 2 |
| ASSEMBLY 0105/00 WATER, TEST & BALANCE CHILLER | 0.0 | 0.1 | 0.0 | 0.1 | 0.9% | 0.00 | 3 | 1 |
| ASSEMBLY 0107/00 WATER, TEST & BALANCE FAN COIL, FIN TUBE | 0.0 | 1.3 | 0.0 | 1.3 | 11.4% | 0.06 | 69 | 20 |
| ASSEMBLY 0109/00 WATER, TEST & BALANCE PUMP | 0.0 | 0.2 | 0.0 | 0.2 | 1.8% | 0.01 | 10 | 3 |
| ASSEMBLY 0202/00 TEST & BALANCE H & V UNIT/IN LINE FAN | 0.0 | 7.6 | 0.1 | 7.7 | 67.5% | 0.37 | 407 | 111 |
| ASSEMBLY 0204/00 TEST & BALANCE ROOF EXHAUST FAN | 0.0 | 0.1 | 0.0 | 0.1 | 0.9% | 0.01 | 8 | 2 |
| ASSEMBLY 0212/00 TEST & BALANCE REGISTER AVERAGE CEILING HEIGHT | 0.0 | 1.5 | 0.0 | 1.5 | 13.2% | 0.07 | 81 | 22 |
| SUBSYSTEM 07 TOTAL | 0.2 | 11.0 | 0.2 | 11.4 | 11.1% | 0.54 | 584 | 160 |
| PERCENT OF SUBSYSTEM TOTAL | 1.8% | 96.5% | 1.7% | | | | | |
| SYSTEM 09 H.V.A.C | | | | | | | | |
| SUBSYSTEM 08 VENTILATING/EXHAUST SYSTEMS | | | | | | | | |
| ASSEMBLY 0130/00 .2 MCFM EXHAUST SYSTEM FOR BOQ | 0.5 | 0.1 | 0.0 | 0.6 | 4.7% | 0.03 | 6 | 2 |
| ASSEMBLY 0194/00 1.95 MCFM EXHAUST SYSTEM FOR BOQ | 9.1 | 2.9 | 0.1 | 12.1 | 95.3% | 0.57 | 182 | 53 |

[> CONTINUED NEXT PAGE <]

GENERIC NUSING HOME MODEL, COMPUTER OUTPUT-ASSEMBLY LEVEL, PROJECT DEFINITION RUN

| SYSTEM/SUBSYSTEM ASSEMBLY DESCRIPTION | $ MAT (000) | $ LAB (000) | $ EQ (000) | $ TOTAL (000) | % TOT | $/FAC QTY | TOT MH | TOT EH |
|---|---|---|---|---|---|---|---|---|
| SUBSYSTEM 08 TOTAL | 9.6 | 3.0 | 0.1 | 12.7 | 12.3% | 0.60 | 188 | 54 |
| PERCENT OF SUBSYSTEM TOTAL | 75.6% | 23.6% | 0.8% | | | | | |
| SYSTEM 09 TOTAL | 60.8 | 41.3 | 1.0 | 103.1 | 8.3% | 4.90 | 2,408 | 730 |
| PERCENT OF SYSTEM TOTAL | 59.0% | 40.1% | 0.9% | | | | | |
| SYSTEM 10 SPECIAL MECHANICAL SYSTEMS | | | | | | | | |
| SUBSYSTEM 01 FIRE PROTECTION | | | | | | | | |
| ASSEMBLY 0105/00 FIRE PROTECTION WATER SUPPLY | 5.2 | 0.5 | 0.0 | 5.7 | 23.5% | 0.27 | 30 | 9 |
| ASSEMBLY 0202/00 CONCEALED SPRINKLER HEADS, PIPES & FITTINGS -ORD. HAZ. | 18.6 | 0.0 | 0.0 | 18.6 | 76.5% | 0.88 | 0 | 0 |
| SUBSYSTEM 01 TOTAL | 23.8 | 0.5 | 0.0 | 24.3 | 100.0% | 1.16 | 30 | 9 |
| PERCENT OF SUBSYSTEM TOTAL | 97.9% | 2.1% | 0.0% | | | | | |
| SYSTEM 10 TOTAL | 23.8 | 0.5 | 0.0 | 24.3 | 2.0% | 1.16 | 30 | 9 |
| PERCENT OF SYSTEM TOTAL | 97.9% | 2.1% | 0.0% | | | | | |
| SYSTEM 11 ELECTRICAL | | | | | | | | |
| SUBSYSTEM 01 SERVICE AND DISTRIBUTION | | | | | | | | |
| ASSEMBLY 0306/00 UNGRD 600 AMP MAIN SWITCHBOARD | 30.1 | 2.6 | 0.0 | 32.7 | 64.8% | 1.55 | 113 | 10 |
| ASSEMBLY 0501/00 PANELBD 208V 100A 24 CIR MLO W/BKR | 1.8 | 2.5 | 0.0 | 4.3 | 8.5% | 0.21 | 116 | 11 |
| ASSEMBLY 0506/00 PANELBD 208V 225A 36 CIR MLO W/BKR | 3.3 | 3.5 | 0.0 | 6.8 | 13.5% | 0.33 | 161 | 15 |
| ASSEMBLY 0536/00 PANELBD 480V 225A 36 CIR MLO W/BKR | 1.7 | 1.5 | 0.0 | 3.2 | 6.3% | 0.15 | 67 | 6 |
| ASSEMBLY 0537/00 PANELBD 480V 225A 42 CIR MLO W/BKR | 1.8 | 1.5 | 0.0 | 3.3 | 6.5% | 0.16 | 70 | 7 |
| SUBSYSTEM 01 TOTAL | 38.7 | 11.7 | 0.1 | 50.5 | 26.8% | 2.39 | 528 | 50 |
| PERCENT OF SUBSYSTEM TOTAL | 76.6% | 23.2% | 0.2% | | | | | |
| SYSTEM 11 ELECTRICAL | | | | | | | | |
| SUBSYSTEM 02 LIGHTING & POWER | | | | | | | | |
| ASSEMBLY 0101/00 120 VOLT, 20 AMP DUPLEX RECEPTACLE - STUD PARTITION | 0.5 | 1.9 | 0.0 | 2.4 | 1.7% | 0.12 | 88 | 8 |
| ASSEMBLY 0102/00 120 VOLT, 20 AMP DUPLEX RECEPTACLE - MASONRY PARTITION | 5.2 | 18.6 | 0.1 | 23.9 | 17.3% | 1.14 | 856 | 80 |

[> CONTINUED NEXT PAGE <]

GENERIC NUSING HOME MODEL, COMPUTER OUTPUT-ASSEMBLY LEVEL, PROJECT DEFINITION RUN

| SYSTEM/SUBSYSTEM ASSEMBLY DESCRIPTION | $ MAT (000) | $ LAB (000) | $ EQ (000) | $ TOTAL (000) | % TOT | $/FAC QTY | TOT MH | TOT EH |
|---|---|---|---|---|---|---|---|---|
| ASSEMBLY 0229/00 100W HPS WALL MOUNT | 0.2 | 0.2 | 0.0 | 0.4 | 0.3% | 0.02 | 8 | 1 |
| ASSEMBLY 0230/00 100W MERCURY VAPOR WALLMOUNT | 0.3 | 0.7 | 0.0 | 1.0 | 0.7% | 0.05 | 33 | 3 |
| ASSEMBLY 0235/00 150 WATT HPS RECESSED FIXTURE | 1.0 | 1.0 | 0.0 | 2.0 | 1.4% | 0.09 | 46 | 4 |
| ASSEMBLY 0249/00 150W PENDANT MOUNT INDUSTRIAL FIXTURE | 2.4 | 4.9 | 0.0 | 7.3 | 5.3% | 0.35 | 230 | 22 |
| ASSEMBLY 0272/00 EXIT LIGHT WITH BATTERY BACKUP | 0.5 | 0.9 | 0.0 | 1.4 | 1.0% | 0.07 | 41 | 4 |
| ASSEMBLY 0274/00 6V EMERGENCY BATTERY PACK | 0.2 | 0.2 | 0.0 | 0.4 | 0.3% | 0.02 | 8 | 1 |
| ASSEMBLY 0276/00 PORCELAIN LAMP HOLDER | 0.6 | 2.7 | 0.0 | 3.3 | 2.4% | 0.16 | 126 | 12 |
| SUBSYSTEM 02 TOTAL | 41.5 | 96.2 | 0.6 | 138.3 | 73.3% | 6.57 | 4,478 | 419 |
| PERCENT OF SUBSYSTEM TOTAL | 30.0% | 69.6% | 0.4% | | | | | |
| SYSTEM 11 TOTAL | 80.2 | 107.8 | 0.6 | 188.6 | 15.2% | 8.96 | 5,005 | 469 |
| *PERCENT OF SYSTEM TOTAL* | 42.5% | 57.2% | 0.3% | | | | | |
| SYSTEM 12 SPECIAL ELECTRICAL SYSTEMS | | | | | | | | |
| SUBSYSTEM 01 COMMUNICATION & ALARM SYSTEMS | | | | | | | | |
| ASSEMBLY 0102/00 FIRE ALARM SYSTEM - RATE OF RISE HEAT DETECTORS | 6.5 | 16.8 | 0.1 | 23.4 | 65.9% | 1.11 | 783 | 73 |
| ASSEMBLY 0104/00 FIRE ALARM DUCT SMOKE DETECTOR | 0.3 | 0.3 | 0.0 | 0.6 | 1.7% | 0.03 | 13 | 1 |
| ASSEMBLY 0118/00 12-ZONE FACP WITH ANNUM AND TRANSMITTER | 9.9 | 1.6 | 0.0 | 11.5 | 32.4% | 0.55 | 70 | 6 |
| SUBSYSTEM 01 TOTAL | 16.7 | 18.7 | 0.1 | 35.5 | 100.0% | 1.68 | 866 | 81 |
| PERCENT OF SUBSYSTEM TOTAL | 47.0% | 52.7% | 0.3% | | | | | |
| SYSTEM 12 TOTAL | 16.7 | 18.7 | 0.1 | 35.5 | 2.9% | 1.68 | 866 | 81 |
| PERCENT OF SYSTEM TOTAL | 47.0% | 52.7% | 0.3% | | | | | |
| SYSTEM 13 EQUIPMENT | | | | | | | | |
| SUBSYSTEM 03 FURNISHINGS | | | | | | | | |
| ASSEMBLY 0201/00 HORIZONTAL BLINDS | 1.2 | 0.1 | 0.0 | 1.3 | 100.0% | 0.06 | 8 | 2 |
| SUBSYSTEM 03 TOTAL | 1.2 | 0.1 | 0.0 | 1.3 | 100.0% | 0.06 | 8 | 2 |
| PERCENT OF SUBSYSTEM TOTAL | 92.3% | 7.7% | 0.0% | | | | | |

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GENERIC NUSING HOME MODEL, COMPUTER OUTPUT-ASSEMBLY LEVEL, PROJECT DEFINITION RUN

| SYSTEM/SUBSYSTEM ASSEMBLY DESCRIPTION | $ MAT (000) | $ LAB (000) | $ EQ (000) | $ TOTAL (000) | % TOT | $/FAC QTY | TOT MH | TOT EH |
|---|---|---|---|---|---|---|---|---|
| ASSEMBLY 0229/00 100W HPS WALL MOUNT | 0.2 | 0.2 | 0.0 | 0.4 | 0.3% | 0.02 | 8 | 1 |
| ASSEMBLY 0230/00 100W MERCURY VAPOR WALLMOUNT | 0.3 | 0.7 | 0.0 | 1.0 | 0.7% | 0.05 | 33 | 3 |
| ASSEMBLY 0235/00 150 WATT HPS RECESSED FIXTURE | 1.0 | 1.0 | 0.0 | 2.0 | 1.4% | 0.09 | 46 | 4 |
| ASSEMBLY 0249/00 150W PENDANT MOUNT INDUSTRIAL FIXTURE | 2.4 | 4.9 | 0.0 | 7.3 | 5.3% | 0.35 | 230 | 22 |
| ASSEMBLY 0272/00 EXIT LIGHT WITH BATTERY BACKUP | 0.5 | 0.9 | 0.0 | 1.4 | 1.0% | 0.07 | 41 | 4 |
| ASSEMBLY 0274/00 6V EMERGENCY BATTERY PACK | 0.2 | 0.2 | 0.0 | 0.4 | 0.3% | 0.02 | 8 | 1 |
| ASSEMBLY 0276/00 PORCELAIN LAMP HOLDER | 0.6 | 2.7 | 0.0 | 3.3 | 2.4% | 0.16 | 126 | 12 |
| SUBSYSTEM 02 TOTAL | 41.5 | 96.2 | 0.6 | 138.3 | 73.3% | 6.57 | 4,478 | 419 |
| PERCENT OF SUBSYSTEM TOTAL | 30.0% | 69.6% | 0.4% | | | | | |
| SYSTEM 11 TOTAL | 80.2 | 107.8 | 0.6 | 188.6 | 15.2% | 8.96 | 5,005 | 469 |
| PERCENT OF SYSTEM TOTAL | 42.5% | 57.2% | 0.3% | | | | | |
| SYSTEM 12 SPECIAL ELECTRICAL SYSTEMS | | | | | | | | |
| SUBSYSTEM 01 COMMUNICATION & ALARM SYSTEMS | | | | | | | | |
| ASSEMBLY 0102/00 FIRE ALARM SYSTEM - RATE OF RISE HEAT DETECTORS | 6.5 | 16.8 | 0.1 | 23.4 | 65.9% | 1.11 | 783 | 73 |
| ASSEMBLY 0104/00 FIRE ALARM DUCT SMOKE DETECTOR | 0.3 | 0.3 | 0.0 | 0.6 | 1.7% | 0.03 | 13 | 1 |
| ASSEMBLY 0118/00 12-ZONE FACP WITH ANNUM AND TRANSMITTER | 9.9 | 1.6 | 0.0 | 11.5 | 32.4% | 0.55 | 70 | 6 |
| SUBSYSTEM 01 TOTAL | 16.7 | 18.7 | 0.1 | 35.5 | 100.0% | 1.68 | 866 | 81 |
| PERCENT OF SUBSYSTEM TOTAL | 47.0% | 52.7% | 0.3% | | | | | |
| SYSTEM 12 TOTAL | 16.7 | 18.7 | 0.1 | 35.5 | 2.9% | 1.68 | 866 | 81 |
| PERCENT OF SYSTEM TOTAL | 47.0% | 52.7% | 0.3% | | | | | |
| SYSTEM 13 EQUIPMENT | | | | | | | | |
| SUBSYSTEM 03 FURNISHINGS | | | | | | | | |
| ASSEMBLY 0201/00 HORIZONTAL BLINDS | 1.2 | 0.1 | 0.0 | 1.3 | 100.0% | 0.06 | 8 | 2 |
| SUBSYSTEM 03 TOTAL | 1.2 | 0.1 | 0.0 | 1.3 | 100.0% | 0.06 | 8 | 2 |
| PERCENT OF SUBSYSTEM TOTAL | 92.3% | 7.7% | 0.0% | | | | | |

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GENERIC NUSING HOME MODEL, COMPUTER OUTPUT-ASSEMBLY LEVEL, PROJECT DEFINITION RUN

| SYSTEM/SUBSYSTEM ASSEMBLY DESCRIPTION | $ MAT (000) | $ LAB (000) | $ EQ (000) | $ TOTAL (000) | % TOT | $/FAC QTY | TOT MH | TOT EH |
|---|---|---|---|---|---|---|---|---|
| SYSTEM 13 TOTAL | 1.2 | 0.1 | 0.0 | 1.3 | 0.1% | 0.06 | 8 | 2 |
| PERCENT OF SYSTEM TOTAL | 92.3% | 7.7% | 0.0% | | | | | |
| FACILITY TOTAL | 693.3 | 532.0 | 16.4 | 1,241.7 | 100.0% | 58.97 | 33,557 | 7,200 |
| PERCENT OF FACILITY TOTAL | 55.8% | 42.8% | 1.4% | | | | | |

# APPENDIX C

# NURSING HOME DESIGN MODEL, DIRECT COSTS

NURSING HOME DESIGN MODEL, INPUT PARAMETERS, QTO RUN, DIRECT COSTS

| | UM | MODEL/ESTIMATED QUANTITY | USER QUANTITY |
|---|---|---|---|
| MINIMUM PARAMETERS: | | | |
| GROSS FLOOR AREA | SF | 23461 | 23461 |
| MODEL FULL SCOPE | SF | 23077 | 23077 |
| MODEL HALF SCOPE | SF | 384 | 384 |
| PROJECT TOTAL SCOPE | SF | 23269 | 23269 |
| PROJECT FULL SCOPE | SF | 23077 | 23077 |
| PROJECT HALF SCOPE | SF | 192 | 192 |
| STORIES ABOVE GRADE | ST | 2 | 1 * |
| LOCATION MODIFIERS: | | | |
| SEISMIC ZONE | NA | 0 | 0 |
| A/C WEATHER ZONE | NA | B | B |
| HEATING/INSULATION ZONE | NA | C | C |
| FROST LINE DEPTH | IN | 2 | 2 |
| FUNCTIONAL SPACE AREAS: | | | |
| COVERED WALKWAYS AND SERVICE AREAS | SF | 384 | 0 * |
| LAJNDRY, STORAGE, AND MAID'S ROOM | SF | 1579 | 1223 * |
| LOUNGE AND GAME ROOM | SF | 1462 | 577 * |
| MECHANICAL, ELECTRICAL, & BUILDING SUPPORT | SF | 2195 | 0 * |
| ENLISTED QUARTERS (544 SF/UNIT) | SF | 17841 | 9763 * |
| ADMIN MODULE - MEDIUM | SF | 0 | 642 * |
| BUILDING SUPPORT AREA | SF | 0 | 6104 * |
| COVERED EXTERIOR ENTRYWAY | SF | 0 | 384 * |
| DINING AREA; 40-250 PERSONS | SF | 0 | 2995 * |
| NURSING | SF | 0 | 382 * |
| CLOSED OFFICE SPACE | SF | 0 | 557 * |
| PUBLIC AREA - WAREHOUSE | SF | 0 | 411 * |
| GENERAL PURPOSE STORAGE | SF | 0 | 423 * |
| QUANTITY PARAMETERS: | | | |
| FLOOR TO FLOOR HEIGHT ABOVE GRADE | FT | 9 | 12 * |
| FLOOR TO FLOOR HEIGHT BELOW GRADE | FT | 12 | 0 * |
| FLOOR TO CEILING HEIGHT ABOVE GRADE | FT | 8 | 10 * |
| FLOOR TO CEILING HEIGHT BELOW GRADE | FT | 9 | 0 * |
| FOOTPRINT | SF | 23461 | 23461 |
| AIR CHANGES PER HOUR | ACH | .34652 | .32485 * |
| PLUMBING DOMESTIC WATER SUPPLY | EA | 116 | 113 * |
| PLUMBING SANITARY WASTE SYSTEM | EA | 121 | 129 * |
| PERIMETER | LF | 1164 | 1176 * |

* THIS VALUE WAS INPUT BY THE USER.

NURSING HOME DESIGN MODEL, INPUT PARAMETERS, QTO RUN, DIRECT COSTS

| | UM | MODEL/ESTIMATED QUANTITY | USER QUANTITY |
|---|---|---|---|
| **QUANTITY PARAMETERS:** | | | |
| ROOF AREA | SF | 24833 | 26702 * |
| EXTERIOR WALL AREA | SF | 11252 | 14112 * |
| EXTERIOR WINDOW AREA | SF | 829 | 2004 * |
| HEATING LOAD | MBH | 284 | 654 * |
| COOLING LOAD | TONS | 22.48 | 66.29 * |
| ELECTRIC LOAD | AMPS | 498 | 800 * |
| EXTERIOR DOORS | EA | 15 | 10 * |
| **DESCRIPTIVE PARAMETERS:** | | | |
| SOIL TYPE | | AVG BEARING CAP | AVG BEARING CAP |
| FLOOR STRUCTURE TYPE | | N/A | N/A |
| ROOF STRUCTURE TYPE | | STEEL LITE JOIS | LOAD BEAR-TRUSS * |
| BAY SIZE / SPAN LENGTH | | 30 - 50 LF | 0 - 30 LF * |
| STAIR TYPE | | N/A | N/A |
| ROOFING TYPE | | STAND SEAM METL | SHINGLE * |
| EXTERIOR WALL TYPE | | BRICK VENEER | CONCRETE BLOCK * |
| HEAT GENERATING SYSTEMS | | WATER BOILR GAS | WATER BOILR GAS |
| COOLING GENERATING SYSTEMS | | RECIPROC CHILLR | RECIPROC CHILLR |
| **DENSITY PARAMETERS - FSA:** | | | |
| INTERIOR PARTITIONS - LAUNDRY, STORAGE & MAID RM | SF | 758 | 2373 * |
| INTERIOR DOORS - LAUNDRY, STORAGE & MAID RM | EA | 1 | 11 * |
| INT WALL FINISH - LAUNDRY, STORAGE & MAID RM | SF | 3026 | 3380 * |
| PLUMBING FIXTURES - LAUNDRY, STORAGE & MAID RM | EA | 10 | 15 * |
| INTERIOR PARTITIONS - LOUNGE AND GAME ROOM | SF | 193 | 497 * |
| INTERIOR DOORS - LOUNGE AND GAME ROOM | EA | 1 | 1 |
| INTERIOR WINDOWS - LOUNGE AND GAME ROOM | SF | 0 | 21 * |
| INT WALL FINISH - LOUNGE AND GAME ROOM | SF | 1079 | 830 * |
| PLUMBING FIXTURES - LOUNGE AND GAME ROOM | EA | 2 | 0 * |
| INTERIOR PARTITIONS - ENLISTED QUARTERS | SF | 25391 | 14084 * |
| INTERIOR DOORS - ENLISTED QUARTERS | EA | 108 | 68 * |
| INT WALL FINISH - ENLISTED QUARTERS | SF | 46302 | 31030 * |
| PLUMBING FIXTURES - ENLISTED QUARTERS | EA | 72 | 73 * |
| INTERIOR PARTITIONS - ADMIN MODULE - MEDIUM | SF | 835 | 1058 * |
| INTERIOR DOORS - ADMIN MODULE - MEDIUM | EA | 3 | 6 * |
| INTERIOR WINDOWS - ADMIN MODULE - MEDIUM | SF | 0 | 84 * |
| INT WALL FINISH - ADMIN MODULE - MEDIUM | SF | 1595 | 1740 * |
| PLUMBING FIXTURES - ADMIN MODULE - MEDIUM | EA | 1 | 4 * |
| INTERIOR PARTITIONS - BUILDING SUPPORT AREA | SF | 6793 | 5973 * |

* THIS VALUE WAS INPUT BY THE USER.

NURSING HOME DESIGN MODEL, INPUT PARAMETERS, QTO RUN, DIRECT COSTS

| | UM | MODEL/ESTIMATED QUANTITY | USER QUANTITY |
|---|---|---|---|
| DENSITY PARAMETERS - FSA: | | | |
| INTERIOR DOORS - BUILDING SUPPORT AREA | EA | 32 | 5 * |
| INTERIOR WINDOWS - BUILDING SUPPORT AREA | SF | 277 | 0 * |
| INT WALL FINISH - BUILDING SUPPORT AREA | SF | 7935 | 7480 * |
| PLUMBING FIXTURES - BUILDING SUPPORT AREA | EA | 26 | 2 * |
| INTERIOR PARTITIONS - DINE AREA;40/250 PERSONS | SF | 2416 | 1491 * |
| INTERIOR DOORS - DINE AREA;40-250 PERSONS | EA | 3 | 7 * |
| INTERIOR WINDOWS - DINE AREA;40-250 PERSONS | SF | 94 | 147 * |
| INT WALL FINISH - DINE AREA;40-250 PERSONS | SF | 2763 | 3100 * |
| PLUMBING FIXTURES - DINE AREA;40-250 PERSONS | EA | 5 | 6 * |
| INTERIOR PARTITIONS - NURSING | SF | 672 | 734 * |
| INTERIOR DOORS - NURSING | EA | 2 | 4 * |
| INT WALL FINISH - NURSING | SF | 1301 | 880 * |
| PLUMBING FIXTURES - NURSING | EA | 2 | 4 * |
| INTERIOR PARTITIONS - CLOSED OFFICE SPACE | SF | 593 | 238 * |
| INTERIOR DOORS - CLOSED OFFICE SPACE | EA | 2 | 1 * |
| INTERIOR WINDOWS - CLOSED OFFICE SPACE | SF | 3 | 21 * |
| INT WALL FINISH - CLOSED OFFICE SPACE | SF | 1538 | 720 * |
| INTERIOR PARTITIONS - PUBLIC AREA - WAREHOUSE | SF | 1195 | 734 * |
| INTERIOR DOORS - PUBLIC AREA - WAREHOUSE | EA | 5 | 3 * |
| INT WALL FINISH - PUBLIC AREA - WAREHOUSE | SF | 1096 | 960 * |
| PLUMBING FIXTURES - PUBLIC AREA - WAREHOUSE | EA | 11 | 9 * |
| INTERIOR PARTITIONS - GENRL PURPOSE STORAGE | SF | 502 | 335 * |
| INTERIOR DOORS - GENRL PURPOSE STORAGE | EA | 3 | 2 * |
| INT OH & SPEC DOORS - GENRL PURPOSE STORAGE | SF | 19 | 0 * |
| INT WALL FINISH - GENRL PURPOSE STORAGE | SF | 1115 | 560 * |

* THIS VALUE WAS INPUT BY THE USER.

NURSING HOME DESIGN MODEL, INPUT PARAMETERS, QTO RUN, DIRECT COSTS

| | | UM | MODEL/ESTIMATED QUANTITY | USER QUANTITY |
|---|---|---|---|---|
| 01 | SUBSTRUCTURE | | | |
| 0101 | STANDARD FOUNDATION | SF | 23,461.000 | 23,461.000 |
| 0101 01 | WALL FOUNDATIONS | LF | 4,680.000 | 5,502.000 * |
| 0101 0102 | 1' X 2' STRIP FOOTING, 3,000 PSI | LF | 770.000 | 2,751.000 * |
| 0101 0103 | 1'0" X 3'0" STRIP FOOTING 3000 PSI | LF | 2,366.000 | .000 * |
| 0101 0116 | 8" MASONRY WALL FOUNDATION - 24" DEEP WALL | LF | .000 | 2,661.000 * |
| 0101 0123 | 8" THICK CONCRETE FOUNDATION WALL 3000 PSI, 60" DEEP | LF | .000 | 90.000 * |
| 0101 0131 | 15" THICK CONRETE FOUNDATION WALL 4000 PSI, 16" DEEP | LF | 2,366.000 | .000 * |
| 0101 02 | COLUMN FOUNDATIONS & PILE CAPS | SF | 23,461.000 | 23,461.000 |
| 0101 0201 | SPREAD FOOTING | CY | 16.000 | .000 * |
| 0101 0241 | SPREAD FTG, REINFORCING STEEL | TONS | 1.000 | .000 * |
| 0101 0277 | SPREAD FTG COL BOLTS | EA. | 235.000 | .000 * |
| 0102 | SPECIAL FOUNDATION CONDITIONS | SF | 23,461.000 | 23,461.000 |
| 0102 01 | PILE FOUNDATIONS | SF | 23,461.000 | 23,461.000 |
| 0103 | SLAB ON GRADE | SF | 23,461.000 | 23,461.000 |
| 0103 01 | STANDARD SLAB ON GRADE | SF | 23,461.000 | 23,461.000 |
| 0103 0101 | 4" STANDARD SLAB ON GRADE | SF | .000 | 24,734.000 * |
| 0103 0102 | 5" STANDARD SLAB ON GRADE | SF | 23,461.000 | .000 * |
| 0103 0104 | 7" STANDARD SLAB ON GRADE | SF | .000 | 1,536.000 * |
| 02 | SUPERSTRUCTURE | | | |
| 0202 | ROOF CONSTRUCTION | SF | 26,702.000 | 26,702.000 |
| 0202 01 | STRUCTURAL FRAME | SF | 26,702.000 | 26,702.000 |
| 0202 0109 | SPEC SPAN, STRUCTURAL STL, LIGHT LD, ROOF FRAME W/DECK | SF | .000 | 400.000 * |
| 0202 0130 | WOOD TRUSS ROOF FRAMING W/ 3/4" PLYWD ROOF DECK | SF | 26,702.000 | 1,764.000 * |
| 0202 02 | STRUCTURAL INTERIOR WALLS | SF | 13,272.000 | .000 * |
| 0202 03 | ROOF DECKS AND SLABS | SF | .000 | 26,702.000 * |
| 0202 0313 | PRECAST/PRESTRESSED ROOF MEMBERS | SF | .000 | 26,702.000 * |
| 03 | ROOFING | | | |
| 0301 | ROOFING | SF | 26,702.000 | 26,702.000 |
| 0301 01 | ROOF COVERINGS | SF | 26,702.000 | 26,702.000 |
| 0301 0103 | 4-PLY BUILT-UP ROOFING WITH FIBERGLASS AND GRAVEL | SF | .000 | 10,320.000 * |
| 0301 0105 | STRIP SHINGLES, 4" SLOPE, MULTI-LAYERED, CLASS A | SF | 26,702.000 | 16,382.000 * |
| 0301 03 | ROOF INSULATION & FILL | SF | 26,702.000 | 26,702.000 |
| 0301 0301 | RIGID INSULATION 1" THICK | SF | .000 | 16,382.000 * |
| 0301 0303 | RIGID INSULATION, 2" THICK | SF | .000 | 10,320.000 * |
| 0301 0307 | 1" RIGID INSULATION (2 LAYERS) | SF | 26,702.000 | .000 * |

* THIS VALUE WAS INPUT BY THE USER.

NURSING HOME DESIGN MODEL, INPUT PARAMETERS, QTO RUN, DIRECT COSTS

| | | UM | MODEL/ESTIMATED QUANTITY | USER QUANTITY |
|---|---|---|---|---|
| 0301 04 | FLASHINGS & TRIM | SF | 2,167.000 | 1,462.000 * |
| 0301 0405 | MISC. ROOFING ITEMS - 12" GRAVEL STOP | LF | 1,462.000 | 1,462.000 |
| 04 | EXTERIOR CLOSURE | | | |
| 0401 | EXTERIOR WALLS | SF | 14,112.000 | 14,112.000 |
| 0401 01 | EXTERIOR SKIN | SF | 12,682.000 | 14,112.000 * |
| 0401 0110 | 8" LOAD BEARING CONCRETE BLOCK EXTERIOR CLOSURE WALL | SF | 14,112.000 | 14,112.000 |
| 0401 02 | INSULATION & VAPOR BARRIER | SF | 12,682.000 | 12,682.000 |
| 0401 0201 | POLYSTYRENE RIGID WALL INSULATION, 1" THICK | SF | 12,682.000 | .000 * |
| 0401 03 | INTERIOR SKIN | SF | 14,112.000 | 14,112.000 |
| 0401 0301 | 3 5/8" MTL. STUD NON-LOAD BEARING INTERIOR SKIN | SF | 11,819.000 | .000 * |
| 0401 0304 | REINFORCED 8" CONCRETE MASONRY UNIT BACK-UP WALL | SF | 2,293.000 | .000 * |
| 0401 05 | EXTERIOR LOUVERS & SCREENS | SF | 46.000 | 46.000 |
| 0401 0501 | FIXED BLADE EXTERIOR LOUVER WITH BAKED ENAMEL FINISH | SF | 46.000 | .000 * |
| 0401 07 | BALCONY WALLS & HANDRAILS | LF | 662.000 | 92.000 * |
| 0401 0701 | 9" SOLID BRICK RAILING 3'-8" HIGH | LF | 46.000 | .000 * |
| 0401 0702 | 3'-8" HIGH - 2" DIA WELDED PIPE RAILING | LF | 46.000 | 92.000 * |
| 0401 08 | EXTERIOR SOFFITS | SF | 2,340.000 | 3,655.000 * |
| 0401 0801 | GYPSUM PLASTER EXTERIOR SOFFITS | SF | 3,655.000 | 3,655.000 |
| 0402 | EXTERIOR DOORS | EA | 10.000 | 10.000 |
| 0402 01 | GLAZED DOORS | EA | 9.000 | .000 * |
| 0402 02 | SOLID DOORS | EA | 1.000 | 10.000 * |
| 0402 0201 | 3'0" X 7'0" HOLLOW METAL DOOR | EA | 10.000 | 5.000 * |
| 0402 0203 | 3'4" X 7'2" HOLLOW METAL | EA | .000 | 5.000 * |
| 0403 | EXTERIOR WINDOWS | SF | 2,004.000 | 2,004.000 |
| 0403 01 | WINDOWS | SF | 2,004.000 | 2,004.000 |
| 0403 0110 | ALUMINUM FRM SLIDING TYPE WINDOW - 3/8" BRONZE | SF | 2,004.000 | 1,738.000 * |
| 0403 0112 | ALUMINUM FRM PROJECTED TYPE WINDOW - 1/4" GREY/BRONZE | SF | .000 | 266.000 * |
| 05 | INTERIOR CONSTRUCTION | | | |
| | ADMIN MODULE - MEDIUM | | | |
| 0501 | PARTITIONS | SF | 1,058.000 | 1,058.000 |
| 0501 01 | FIXED PARTITIONS | SF | 1,058.000 | 980.000 * |
| 0501 0101 | NON-LOAD BRG PARTITION - 16" O.C. | SF | 784.000 | .000 * |
| 0501 0102 | NON-LOAD BRG PARTITION - 24" O.C. | SF | 196.000 | .000 * |
| 0501 0106 | MTL STUD PARTITION 4" - 1/2" GYP BD EA SIDE SOUND RATED | SF | .000 | 730.000 * |
| 0501 0118 | 8 X 8 X 16 LOAD BEARING CONCRETE MASONRY UNIT WALL | SF | .000 | 120.000 * |
| 0501 0119 | 8 X 12 X 16 LOAD BRG REINFORCED CONC. MASONRY UNIT WALL | SF | .000 | 130.000 * |

* THIS VALUE WAS INPUT BY THE USER.

NURSING HOME DESIGN MODEL, INPUT PARAMETERS, QTO RUN, DIRECT COSTS

| | | UM | MODEL/ESTIMATED QUANTITY | USER QUANTITY |
|---|---|---|---|---|
| 0502 | INTERIOR DOORS | EA | 6.000 | 6.000 |
| 0502 01 | STANDARD INTERIOR DOORS | EA | 6.000 | 6.000 |
| 0502 0116 | 3-0 X 7-0 S.C. WOOD DOOR W/H.M. FRAME W/PASSAGE SET | EA | .000 | 6.000 * |
| 0502 0117 | 3'-0" X 7'-0" WOOD DOOR, HM FRM | EA | 6.000 | .000 * |
| | | | | |
| 0503 | INTERIOR WINDOWS | SF | 84.000 | 84.000 |
| 0503 01 | WINDOWS | SF | .000 | 84.000 * |
| 0503 0102 | FIXED TYPE WINDOW WITH ALUMINUM FRM - 1/4 CLEAR GLASS | SF | .000 | 84.000 * |
| | BUILDING SUPPORT AREA | | | |
| 0501 | PARTITIONS | SF | 5,973.000 | 5,973.000 |
| 0501 01 | FIXED PARTITIONS | SF | 5,973.000 | 5,525.000 * |
| 0501 0101 | NON-LOAD BRG PARTITION - 16" O.C. | SF | 276.000 | .000 * |
| 0501 0102 | NON-LOAD BRG PARTITION - 24" O.C. | SF | 1,105.000 | .000 * |
| 0501 0106 | MTL STUD PARTITION 4" - 1/2" GYP BD EA SIDE SOUND RATED | SF | .000 | 285.000 * |
| 0501 0112 | NON-LOAD BRG PARTITION OF 8 X 6 X 16 CONCRETE | SF | 553.000 | .000 * |
| 0501 0113 | NON-LOAD BRG PARTITION OF 8 X 8 X 16 CONCRETE | SF | 3,591.000 | .000 * |
| 0501 0118 | 8 X 8 X 16 LOAD BEARING CONCRETE MASONRY UNIT WALL | SF | .000 | 4,820.000 * |
| 0501 0119 | 8 X 12 X 16 LOAD BRG REINFORCED CONC. MASONRY UNIT WALL | SF | .000 | 420.000 * |
| 0501 04 | INTERIOR BALUSTRADES & SCREENS | LF | 47.000 | 841.000 * |
| 0501 0401 | ALUMINUM BALCONY RAIL | LF | 841.000 | .000 * |
| 0501 0402 | HARDWOOD CUSTOM WALL HANDRAIL W/METAL SUPPORTS | LF | .000 | 841.000 * |
| | | | | |
| 0502 | INTERIOR DOORS | EA | 5.000 | 5.000 |
| 0502 01 | STANDARD INTERIOR DOORS | EA | 3.000 | 5.000 * |
| 0502 0108 | 4'-0" X 7'-0" HOLLOW METAL DOOR | EA | 1.000 | .000 * |
| 0502 0111 | 8'-0" X 7'-0" PAIR HOLLOW METAL DOORS | EA | 1.000 | .000 * |
| 0502 0116 | 3-0 X 7-0 S.C. WOOD DOOR W/H.M. FRAME W/PASSAGE SET | EA | .000 | 1.000 * |
| 0502 0117 | 3'-0" X 7'-0" WOOD DOOR, HM FRM | EA | 2.000 | .000 * |
| 0502 0118 | 4'-0" X 7'-0" WOOD DOOR, HM FRM | EA | 1.000 | .000 * |
| 0502 0119 | 6'-0" X 7'-0" PAIR WOOD DOORS, HM FRM | EA | 1.000 | .000 * |
| 0502 02 | GLAZED INTERIOR DOORS | EA | 1.000 | .000 * |
| 0502 04 | FIRE DOORS | EA | 2.000 | 4.000 * |
| 0502 0401 | 3'-0" X 7'-0" FIRE RATED HOLLOW METAL DOOR | EA | 1.000 | .000 * |
| 0502 0402 | 6'-0" X 7'-0" PAIR FIRE RATED HOLLOW METAL DOORS | EA | 1.000 | .000 * |
| 0502 0405 | 3'-0" X 7'-0" FIRE RATED WOOD DOOR | EA | 1.000 | .000 * |
| 0502 0406 | 6'-0" X 7'-0" PAIR FIRE RATED WOOD DOORS | EA | 1.000 | 4.000 * |
| | DINING AREA; 40-250 PERSON | | | |
| 0501 | PARTITIONS | SF | 1,491.000 | 1,491.000 |

* THIS VALUE WAS INPUT BY THE USER.

NURSING HOME DESIGN MODEL, INPUT PARAMETERS, QTO RUN, DIRECT COSTS

| | | UM | MODEL/ESTIMATED QUANTITY | USER QUANTITY |
|---|---|---|---|---|
| 0501 01 | FIXED PARTITIONS | SF | 1,788.000 | 1,258.000 * |
| 0501 0101 | NON-LOAD BRG PARTITION - 16" O.C. | SF | 931.000 | .000 * |
| 0501 0105 | MTL STUD PARTITION 4" - 1/2" GYP BD EACH SIDE | SF | 304.000 | .000 * |
| 0501 0106 | MTL STUD PARTITION 4" - 1/2" GYP BD EA SIDE SOUND RATED | SF | 23.000 | 108.000 * |
| 0501 0118 | 8 X 8 X 16 LOAD BEARING CONCRETE MASONRY UNIT WALL | SF | .000 | 1,150.000 * |
| 0502 | INTERIOR DOORS | EA | 7.000 | 7.000 |
| 0502 01 | STANDARD INTERIOR DOORS | EA | 4.000 | 7.000 * |
| 0502 0104 | 3'0" X 7'0" HOLLOW METAL DOOR W/CLOSURE | EA | 7.000 | .000 * |
| 0502 0118 | 4'-0" X 7'-0" WOOD DOOR, HM FRM | EA | .000 | 6.000 * |
| 0502 0119 | 6'-0" X 7'-0" PAIR WOOD DOORS, HM FRM | EA | .000 | 1.000 * |
| 0502 02 | GLAZED INTERIOR DOORS | EA | 3.000 | .000 * |
| 0503 | INTERIOR WINDOWS | SF | 147.000 | 147.000 |
| 0503 01 | WINDOWS | SF | 147.000 | 147.000 |
| 0503 0102 | FIXED TYPE WINDOW WITH ALUMINUM FRM - 1/4 CLEAR GLASS | SF | 147.000 | 147.000 |
| | LAUNDRY, STORAGE, AND MAID'S ROOM | | | |
| 0501 | PARTITIONS | SF | 2,373.000 | 2,373.000 |
| 0501 01 | FIXED PARTITIONS | SF | 2,260.000 | 2,288.000 * |
| 0501 0102 | NON-LOAD BRG PARTITION - 24" O.C. | SF | 2,288.000 | .000 * |
| 0501 0106 | MTL STUD PARTITION 4" - 1/2" GYP BD EA SIDE SOUND RATED | SF | .000 | 410.000 * |
| 0501 0118 | 8 X 8 X 16 LOAD BEARING CONCRETE MASONRY UNIT WALL | SF | .000 | 1,658.000 * |
| 0501 0119 | 8 X 12 X 16 LOAD BRG REINFORCED CONC. MASONRY UNIT WALL | SF | .000 | 220.000 * |
| 0502 | INTERIOR DOORS | EA | 11.000 | 11.000 |
| 0502 01 | STANDARD INTERIOR DOORS | EA | 11.000 | 11.000 |
| 0502 0116 | 3-0 X 7-0 S.C. WOOD DOOR W/H.M. FRAME W/PASSAGE SET | EA | .000 | 11.000 * |
| 0502 0117 | 3'-0" X 7'-0" WOOD DOOR, HM FRM | EA | 11.000 | .000 * |
| | LOUNGE AND GAME ROOM | | | |
| 0501 | PARTITIONS | SF | 497.000 | 497.000 |
| 0501 01 | FIXED PARTITIONS | SF | 592.000 | 388.000 * |
| 0501 0102 | NON-LOAD BRG PARTITION - 24" O.C. | SF | 388.000 | .000 * |
| 0501 0118 | 8 X 8 X 16 LOAD BEARING CONCRETE MASONRY UNIT WALL | SF | .000 | 318.000 * |
| 0501 0119 | 8 X 12 X 16 LOAD BRG REINFORCED CONC. MASONRY UNIT WALL | SF | .000 | 70.000 * |
| 0502 | INTERIOR DOORS | EA | 1.000 | 1.000 |
| 0502 01 | STANDARD INTERIOR DOORS | EA | 1.000 | 1.000 |
| 0502 0116 | 3-0 X 7-0 S.C. WOOD DOOR W/H.M. FRAME W/PASSAGE SET | EA | .000 | 1.000 * |

* THIS VALUE WAS INPUT BY THE USER.

NURSING HOME DESIGN MODEL, INPUT PARAMETERS, QTO RUN, DIRECT COSTS

| | | UM | MODEL/ESTIMATED QUANTITY | USER QUANTITY |
|---|---|---|---|---|
| 0502 0117 | 3'-0" X 7'-0" WOOD DOOR, HM FRM | EA | 1.000 | .000 * |
| 0503 | INTERIOR WINDOWS | SF | 21.000 | 21.000 |
| 0503 01 | WINDOWS | SF | .000 | 21.000 * |
| 0503 0101 | FIXED TYPE WINDOW WITH ALUMINUM FRM - 1/4" WIRED GLASS | SF | .000 | 21.000 * |
| | NURSING | | | |
| 0501 | PARTITIONS | SF | 734.000 | 734.000 |
| 0501 01 | FIXED PARTITIONS | SF | 734.000 | 683.000 * |
| 0501 0102 | NON-LOAD BRG PARTITION - 24" O.C. | SF | 683.000 | .000 * |
| 0501 0106 | MTL STUD PARTITION 4" - 1/2" GYP BD EA SIDE SOUND RATED | SF | .000 | 310.000 * |
| 0501 0118 | 8 X 8 X 16 LOAD BEARING CONCRETE MASONRY UNIT WALL | SF | .000 | 198.000 * |
| 0501 0119 | 8 X 12 X 16 LOAD BRG REINFORCED CONC. MASONRY UNIT WALL | SF | .000 | 175.000 * |
| 0502 | INTERIOR DOORS | EA | 4.000 | 4.000 |
| 0502 01 | STANDARD INTERIOR DOORS | EA | 4.000 | 4.000 |
| 0502 0109 | 4'0" X 8'0" HOLLOW METAL DOOR | EA | 4.000 | .000 * |
| 0502 0116 | 3-0 X 7-0 S.C. WOOD DOOR W/H.M. FRAME W/PASSAGE SET | EA | .000 | 4.000 * |
| | OFFICE - CLOSED OFFICE SPACE | | | |
| 0501 | PARTITIONS | SF | 238.000 | 238.000 |
| 0501 01 | FIXED PARTITIONS | SF | 238.000 | 223.000 * |
| 0501 0101 | NON-LOAD BRG PARTITION - 16" O.C. | SF | 201.000 | .000 * |
| 0501 0102 | NON-LOAD BRG PARTITION - 24" O.C. | SF | 22.000 | .000 * |
| 0501 0118 | 8 X 8 X 16 LOAD BEARING CONCRETE MASONRY UNIT WALL | SF | .000 | 223.000 * |
| 0502 | INTERIOR DOORS | EA | 1.000 | 1.000 |
| 0502 01 | STANDARD INTERIOR DOORS | EA | 1.000 | 1.000 |
| 0502 0116 | 3-0 X 7-0 S.C. WOOD DOOR W/H.M. FRAME W/PASSAGE SET | EA | .000 | 1.000 * |
| 0502 0117 | 3'-0" X 7'-0" WOOD DOOR, HM FRM | EA | 1.000 | .000 * |
| 0502 04 | FIRE DOORS | EA | 1.000 | .000 * |
| 0503 | INTERIOR WINDOWS | SF | 21.000 | 21.000 |
| 0503 01 | WINDOWS | SF | 21.000 | .000 * |
| | PUBLIC AREA - WAREHOUSE | | | |
| 0501 | PARTITIONS | SF | 734.000 | 734.000 |
| 0501 01 | FIXED PARTITIONS | SF | 477.000 | 683.000 * |

* THIS VALUE WAS INPUT BY THE USER.

NURSING HOME DESIGN MODEL, INPUT PARAMETERS, QTO RUN, DIRECT COSTS

| | | UM | MODEL/ESTIMATED QUANTITY | USER QUANTITY |
|---|---|---|---|---|
| 0501 0106 | MTL STUD PARTITION 4" - 1/2" GYP BD EA SIDE SOUND RATED | SF | .000 | 110.000 * |
| 0501 0114 | NON-LOAD BEARING 8 X 8 X 16 CONCRETE BLOCK | SF | 683.000 | .000 * |
| 0501 0118 | 8 X 8 X 16 LOAD BEARING CONCRETE MASONRY UNIT WALL | SF | .000 | 488.000 * |
| 0501 0119 | 8 X 12 X 16 LOAD BRG REINFORCED CONC. MASONRY UNIT WALL | SF | .000 | 85.000 * |
| 0502 | INTERIOR DOORS | EA | 3.000 | 3.000 |
| 0502 01 | STANDARD INTERIOR DOORS | EA | 3.000 | 3.000 |
| 0502 0106 | 3'4" X 7'2" H.M. DOOR W/LOCKSET | EA | 3.000 | .000 * |
| 0502 0116 | 3-0 X 7-0 S.C. WOOD DOOR W/H.M. FRAME W/PASSAGE SET | EA | .000 | 3.000 * |
| | **QUARTERS - ENLISTED (544 SF/UNIT)** | | | |
| 0501 | PARTITIONS | SF | 14,084.000 | 14,084.000 |
| 0501 01 | FIXED PARTITIONS | SF | 13,413.000 | 13,041.000 * |
| 0501 0102 | NON-LOAD BRG PARTITION - 24" O.C. | SF | 9,038.000 | .000 * |
| 0501 0106 | MTL STUD PARTITION 4" - 1/2" GYP BD EA SIDE SOUND RATED | SF | 2,215.000 | 7,208.000 * |
| 0501 0111 | NON-LOAD BRG PARTITION OF 8 X 4 X 16 CONCRETE | SF | 1,787.000 | .000 * |
| 0501 0118 | 8 X 8 X 16 LOAD BEARING CONCRETE MASONRY UNIT WALL | SF | .000 | 5,268.000 * |
| 0501 0119 | 8 X 12 X 16 LOAD BRG REINFORCED CONC. MASONRY UNIT WALL | SF | .000 | 570.000 * |
| 0502 | INTERIOR DOORS | EA | 68.000 | 68.000 |
| 0502 01 | STANDARD INTERIOR DOORS | EA | 68.000 | 68.000 |
| 0502 0101 | 3'-0" X 7'-0" HOLLOW METAL DOOR | EA | 17.000 | .000 * |
| 0502 0116 | 3-0 X 7-0 S.C. WOOD DOOR W/H.M. FRAME W/PASSAGE SET | EA | .000 | 34.000 * |
| 0502 0117 | 3'-0" X 7'-0" WOOD DOOR, HM FRM | EA | 51.000 | .000 * |
| 0502 0118 | 4'-0" X 7'-0" WOOD DOOR, HM FRM | EA | .000 | 34.000 * |
| | **STORAGE - GENERAL PURPOSE** | | | |
| 0501 | PARTITIONS | SF | 335.000 | 335.000 |
| 0501 01 | FIXED PARTITIONS | SF | 156.000 | 305.000 * |
| 0501 0113 | NON-LOAD BRG PARTITION OF 8 X 8 X 16 CONCRETE | SF | 192.000 | .000 * |
| 0501 0118 | 8 X 8 X 16 LOAD BEARING CONCRETE MASONRY UNIT WALL | SF | .000 | 305.000 * |
| 0501 0119 | 8 X 12 X 16 LOAD BRG REINFORCED CONC. MASONRY UNIT WALL | SF | 113.000 | .000 * |
| 0502 | INTERIOR DOORS | EA | 2.000 | 2.000 |
| 0502 01 | STANDARD INTERIOR DOORS | EA | .000 | 2.000 * |
| 0502 0116 | 3-0 X 7-0 S.C. WOOD DOOR W/H.M. FRAME W/PASSAGE SET | EA | .000 | 2.000 * |
| 0502 04 | FIRE DOORS | EA | 2.000 | .000 * |
| | **FACILITY TOTAL** | | | |
| 0501 | PARTITIONS | SF | 27,517.000 | 27,517.000 |

* THIS VALUE WAS INPUT BY THE USER.

NURSING HOME DESIGN MODEL, INPUT PARAMETERS, QTO RUN, DIRECT COSTS

| | | UM | MODEL/ESTIMATED QUANTITY | USER QUANTITY |
|---|---|---|---|---|
| 0501 01 | FIXED PARTITIONS | SF | 26,689.000 | 25,374.000 * |
| 0501 0101 | NON-LOAD BRG PARTITION - 16" O.C. | SF | 2,192.000 | .000 * |
| 0501 0102 | NON-LOAD BRG PARTITION - 24" O.C. | SF | 13,720.000 | .000 * |
| 0501 0105 | MTL STUD PARTITION 4" - 1/2" GYP BD EACH SIDE | SF | 304.000 | .000 * |
| 0501 0106 | MTL STUD PARTITION 4" - 1/2" GYP BD EA SIDE SOUND RATED | SF | 2,238.000 | 9,161.000 * |
| 0501 0111 | NON-LOAD BRG PARTITION OF 8 X 4 X 16 CONCRETE | SF | 1,787.000 | .000 * |
| 0501 0112 | NON-LOAD BRG PARTITION OF 8 X 6 X 16 CONCRETE | SF | 553.000 | .000 * |
| 0501 0113 | NON-LOAD BRG PARTITION OF 8 X 8 X 16 CONCRETE | SF | 3,783.000 | .000 * |
| 0501 0114 | NON-LOAD BEARING 8 X 8 X 16 CONCRETE BLOCK | SF | 683.000 | .000 * |
| 0501 0118 | 8 X 8 X 16 LOAD BEARING CONCRETE MASONRY UNIT WALL | SF | .000 | 14,548.000 * |
| 0501 0119 | 8 X 12 X 16 LOAD BRG REINFORCED CONC. MASONRY UNIT WALL | SF | 113.000 | 1,670.000 * |
| 0501 04 | INTERIOR BALUSTRADES & SCREENS | LF | 47.000 | 841.000 * |
| 0501 0401 | ALUMINUM BALCONY RAIL | LF | 841.000 | .000 * |
| 0501 0402 | HARDWOOD CUSTOM WALL HANDRAIL W/METAL SUPPORTS | LF | .000 | 841.000 * |
| 0502 | INTERIOR DOORS | EA | 108.000 | 108.000 |
| 0502 01 | STANDARD INTERIOR DOORS | EA | 101.000 | 108.000 * |
| 0502 0101 | 3'-0" X 7'-0" HOLLOW METAL DOOR | EA | 17.000 | .000 * |
| 0502 0104 | 3'0" X 7'0" HOLLOW METAL DOOR W/CLOSURE | EA | 7.000 | .000 * |
| 0502 0106 | 3'4" X 7'2" H.M. DOOR W/LOCKSET | EA | 3.000 | .000 * |
| 0502 0108 | 4'-0" X 7'-0" HOLLOW METAL DOOR | EA | 1.000 | .000 * |
| 0502 0109 | 4'0" X 8'0" HOLLOW METAL DOOR | EA | 4.000 | .000 * |
| 0502 0111 | 8'-0" X 7'-0" PAIR HOLLOW METAL DOORS | EA | 1.000 | .000 * |
| 0502 0116 | 3-0 X 7-0 S.C. WOOD DOOR W/H.M. FRAME W/PASSAGE SET | EA | .000 | 63.000 * |
| 0502 0117 | 3'-0" X 7'-0" WOOD DOOR, HM FRM | EA | 72.000 | .000 * |
| 0502 0118 | 4'-0" X 7'-0" WOOD DOOR, HM FRM | EA | 1.000 | 40.000 * |
| 0502 0119 | 6'-0" X 7'-0" PAIR WOOD DOORS, HM FRM | EA | 1.000 | 1.000 |
| 0502 02 | GLAZED INTERIOR DOORS | EA | 4.000 | .000 * |
| 0502 04 | FIRE DOORS | EA | 9.000 | 4.000 * |
| 0502 0401 | 3'-0" X 7'-0" FIRE RATED HOLLOW METAL DOOR | EA | 1.000 | .000 * |
| 0502 0402 | 6'-0" X 7'-0" PAIR FIRE RATED HOLLOW METAL DOORS | EA | 1.000 | .000 * |
| 0502 0405 | 3'-0" X 7'-0" FIRE RATED WOOD DOOR | EA | 1.000 | .000 * |
| 0502 0406 | 6'-0" X 7'-0" PAIR FIRE RATED WOOD DOORS | EA | 1.000 | 4.000 * |
| 0503 | INTERIOR WINDOWS | SF | 273.000 | 273.000 |
| 0503 01 | WINDOWS | SF | 168.000 | 252.000 * |
| 0503 0101 | FIXED TYPE WINDOW WITH ALUMINUM FRM - 1/4" WIRED GLASS | SF | .000 | 21.000 * |
| 0503 0102 | FIXED TYPE WINDOW WITH ALUMINUM FRM - 1/4 CLEAR GLASS | SF | 147.000 | 231.000 * |
| 06 | INTERIOR FINISHES | | | |

ADMIN MODULE - MEDIUM

| | | | | |
|---|---|---|---|---|
| 0601 | WALL FINISHES | SF | 1,740.000 | 1,740.000 |

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NURSING HOME DESIGN MODEL, INPUT PARAMETERS, QTO RUN, DIRECT COSTS

| | | UM | MODEL/ESTIMATED QUANTITY | USER QUANTITY |
|---|---|---|---|---|
| 0601 02 | PLASTER WALL FINISHES | SF | .000 | 250.000 * |
| 0601 0201 | 2 COATS OF GYPSUM PLASTER ON 3/8" GYPSUM LATH | SF | .000 | 250.000 * |
| 0601 03 | GYPSUM WALLBOARD FINISHES | SF | 151.000 | 630.000 * |
| 0601 0301 | 5/8" GYPSUM BOARD ON 7/8" FURRING CHANNEL | SF | 536.000 | .000 * |
| 0601 0302 | 5/8" GYPSUM BRD ON FURRING CHANNEL W/ RIGID INSULATION | SF | .000 | 630.000 * |
| 0601 0303 | TWO LAYERS OF 5/8" FIRE RESISTANT GYPSUM BOARD | SF | 95.000 | .000 * |
| 0601 04 | TILE & TERRAZZO WALL FINISHES | SF | 52.000 | 1,020.000 * |
| 0601 0401 | 4-1/4" X 4-1/4" CERAMIC TILE TO WALLS | SF | 1,020.000 | 1,020.000 |
| 0601 05 | PAINTING TO WALL | SF | 997.000 | 1,740.000 * |
| 0601 0501 | PAINT TO GYPSUM BOARD WALLS USING ROLLER | SF | 1,392.000 | 1,460.000 * |
| 0601 0502 | PAINT TO CONCRETE BLOCK USING BRUSHES, TWO COATS | SF | 348.000 | 280.000 * |
| 0601 06 | WALL COVERINGS | SF | 540.000 | 860.000 * |
| 0601 0601 | LIGHT WEIGHT VINYL WALLCOVERING WITH FABRIC BACKING | SF | .000 | 860.000 * |
| 0601 0602 | MEDIUM WEIGHT VINYL WALLCOVERING WITH FABRIC BACKING | SF | 860.000 | .000 * |
| 0602 | FLOORING & FLOOR FINISHES | SF | 642.000 | 642.000 |
| 0602 01 | TILE FLOOR FINISHES | SF | 25.000 | 210.000 * |
| 0602 0101 | THIN SET NATURAL CLAY CERAMIC TILE FLOOR AND BASE | SF | 210.000 | 210.000 |
| 0602 05 | CARPETING | SF | 579.000 | 432.000 * |
| 0602 0501 | COMMERCIAL GRADE 26 OZ. NYLON CARPET | SF | 259.000 | 432.000 * |
| 0602 0503 | COMMERCIAL GRADE 30 OZ. WOOL CARPET | SF | 173.000 | .000 * |
| 0602 07 | SPECIAL FLOORING | SF | 38.000 | .000 * |
| 0603 | CEILING & CEILING FINISHES | SF | 642.000 | 642.000 |
| 0603 03 | GYPSUM WALLBOARD CEILING FINISHES | SF | 14.000 | 210.000 * |
| 0603 0301 | 5/8" GYPSUM WALL BOARD CEILING, 1 LAYER, FIRE RATED | SF | .000 | 210.000 * |
| 0603 0302 | 5/8" GYPSUM WALLBOARD CEILING, 3 LAYERS, OVER 8 FT. | SF | 210.000 | .000 * |
| 0603 04 | ACOUSTIC CEILING TILES & PANELS | SF | 628.000 | 432.000 * |
| 0603 0402 | 2' X 2' OR 2' X 4' FIBERGLASS ACOUSTICAL CEILING TILES | SF | 432.000 | 432.000 |
| 0603 06 | PAINTING & STAINING CEILINGS | SF | 14.000 | .000 * |
| 0603 07 | SUSPENSION SYSTEMS | SF | 642.000 | 642.000 |
| 0603 0702 | T-BAR CEILING SUSPENSION SYSTEM 2' X 2' GRID | SF | 628.000 | 432.000 * |
| 0603 0704 | SUSPENSION SYSTEM FOR GYPSUM BOARD CEILING | SF | 14.000 | 210.000 * |

BUILDING SUPPORT AREA

| | | | | |
|---|---|---|---|---|
| 0601 | WALL FINISHES | SF | 7,480.000 | 7,480.000 |
| 0601 02 | PLASTER WALL FINISHES | SF | 3,481.000 | .000 * |
| 0601 03 | GYPSUM WALLBOARD FINISHES | SF | 914.000 | 1,325.000 * |
| 0601 0301 | 5/8" GYPSUM BOARD ON 7/8" FURRING CHANNEL | SF | 1,113.000 | .000 * |
| 0601 0302 | 5/8" GYPSUM BRD ON FURRING CHANNEL W/ RIGID INSULATION | SF | .000 | 1,325.000 * |
| 0601 0303 | TWO LAYERS OF 5/8" FIRE RESISTANT GYPSUM BOARD | SF | 212.000 | .000 * |
| 0601 04 | TILE & TERRAZZO WALL FINISHES | SF | 1,789.000 | .000 * |

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NURSING HOME DESIGN MODEL, INPUT PARAMETERS, QTO RUN, DIRECT COSTS

| | | UM | MODEL/ESTIMATED QUANTITY | USER QUANTITY |
|---|---|---|---|---|
| 0601 05 | PAINTING TO WALL | SF | 4,314.000 | 7,480.000 * |
| 0601 0501 | PAINT TO GYPSUM BOARD WALLS USING ROLLER | SF | 1,870.000 | 1,610.000 * |
| 0601 0502 | PAINT TO CONCRETE BLOCK USING BRUSHES, TWO COATS | SF | 5,610.000 | 5,870.000 * |
| 0601 06 | WALL COVERINGS | SF | 1,611.000 | .000 * |
| | | | | |
| 0602 | FLOORING & FLOOR FINISHES | SF | 6,104.000 | 6,104.000 |
| 0602 01 | TILE FLOOR FINISHES | SF | 954.000 | .000 * |
| 0602 04 | RESILIENT FLOORING | SF | 477.000 | 5,628.000 * |
| 0602 0401 | VINYL TILE, 1/8 "X 12" X 12" | SF | 5,628.000 | 5,628.000 |
| 0602 05 | CARPETING | SF | 2,540.000 | .000 * |
| 0602 06 | MASONRY & STONE FLOORING | SF | 853.000 | .000 * |
| | | | | |
| 0603 | CEILING & CEILING FINISHES | SF | 6,104.000 | 6,104.000 |
| 0603 03 | GYPSUM WALLBOARD CEILING FINISHES | SF | 1,647.000 | .000 * |
| 0603 04 | ACOUSTIC CEILING TILES & PANELS | SF | 3,572.000 | .000 * |
| 0603 06 | PAINTING & STAINING CEILINGS | SF | 1,647.000 | 6,104.000 * |
| 0603 0601 | PAINTING TO DRYWALL OR PLASTER USING ROLLERS, 2 COATS | SF | 6,104.000 | 6,104.000 |
| 0603 07 | SUSPENSION SYSTEMS | SF | 5,220.000 | .000 * |

DINING AREA; 40-250 PERSON

| | | | | |
|---|---|---|---|---|
| 0601 | WALL FINISHES | SF | 3,100.000 | 3,100.000 |
| 0601 02 | PLASTER WALL FINISHES | SF | 579.000 | 1,410.000 * |
| 0601 0201 | 2 COATS OF GYPSUM PLASTER ON 3/8" GYPSUM LATH | SF | 1,410.000 | 1,410.000 |
| 0601 03 | GYPSUM WALLBOARD FINISHES | SF | .000 | 1,720.000 * |
| 0601 0302 | 5/8" GYPSUM BRD ON FURRING CHANNEL W/ RIGID INSULATION | SF | .000 | 1,720.000 * |
| 0601 04 | TILE & TERRAZZO WALL FINISHES | SF | 579.000 | .000 * |
| 0601 05 | PAINTING TO WALL | SF | .000 | 3,100.000 * |
| 0601 0501 | PAINT TO GYPSUM BOARD WALLS USING ROLLER | SF | .000 | 1,936.000 * |
| 0601 0502 | PAINT TO CONCRETE BLOCK USING BRUSHES, TWO COATS | SF | .000 | 1,164.000 * |
| 0601 06 | WALL COVERINGS | SF | 2,689.000 | 1,620.000 * |
| 0601 0601 | LIGHT WEIGHT VINYL WALLCOVERING WITH FABRIC BACKING | SF | .000 | 1,620.000 * |
| 0601 0602 | MEDIUM WEIGHT VINYL WALLCOVERING WITH FABRIC BACKING | SF | 1,620.000 | .000 * |
| | | | | |
| 0602 | FLOORING & FLOOR FINISHES | SF | 2,995.000 | 2,995.000 |
| 0602 01 | TILE FLOOR FINISHES | SF | 308.000 | .000 * |
| 0502 05 | CARPETING | SF | 2,687.000 | 1,552.000 * |
| 0602 0501 | COMMERCIAL GRADE 26 OZ. NYLON CARPET | SF | .000 | 1,552.000 * |
| 0602 0502 | COMMERCIAL GRADE 35 OZ NYLON | SF | 1,552.000 | .000 * |
| | | | | |
| 0603 | CEILING & CEILING FINISHES | SF | 2,995.000 | 2,995.000 |
| 0603 04 | ACOUSTIC CEILING TILES & PANELS | SF | 2,995.000 | 2,995.000 |
| 0603 0402 | 2' X 2' OR 2' X 4' FIBERGLASS ACOUSTICAL CEILING TILES | SF | 2,995.000 | 2,995.000 |

* THIS VALUE WAS INPUT BY THE USER.

NURSING HOME DESIGN MODEL, INPUT PARAMETERS, QTO RUN, DIRECT COSTS

| | | UM | MODEL/ESTIMATED QUANTITY | USER QUANTITY |
|---|---|---|---|---|
| 0603 07 | SUSPENSION SYSTEMS | SF | 2,995.000 | 2,995.000 |
| 0603 0702 | T-BAR CEILING SUSPENSION SYSTEM 2' X 2' GRID | SF | 2,995.000 | 2,995.000 |
| | **LAUNDRY, STORAGE, AND MAID'S ROOM** | | | |
| 0601 | WALL FINISHES | SF | 3,380.000 | 3,380.000 |
| 0601 03 | GYPSUM WALLBOARD FINISHES | SF | .000 | 190.000 * |
| 0601 0302 | 5/8" GYPSUM BRD ON FURRING CHANNEL W/ RIGID INSULATION | SF | .000 | 190.000 * |
| 0601 04 | TILE & TERRAZZO WALL FINISHES | SF | .000 | 1,100.000 * |
| 0601 0401 | 4-1/4" X 4-1/4" CERAMIC TILE TO WALLS | SF | .000 | 1,100.000 * |
| 0601 05 | PAINTING TO WALL | SF | 3,380.000 | 4,670.000 * |
| 0601 0506 | EPOXY PAINT TO DRYWALL | SF | 4,670.000 | 4,670.000 |
| 0602 | FLOORING & FLOOR FINISHES | SF | 1,223.000 | 1,223.000 |
| 0602 01 | TILE FLOOR FINISHES | SF | 1,223.000 | 243.000 * |
| 0602 0101 | THIN SET NATURAL CLAY CERAMIC TILE FLOOR AND BASE | SF | 243.000 | 243.000 |
| 0602 04 | RESILIENT FLOORING | SF | .000 | 983.000 * |
| 0602 0401 | VINYL TILE, 1/8 "X 12" X 12" | SF | .000 | 983.000 * |
| 0603 | CEILING & CEILING FINISHES | SF | 1,223.000 | 1,223.000 |
| 0603 01 | EXPOSED CONCRETE FINISHES | SF | 612.000 | .000 * |
| 0603 03 | GYPSUM WALLBOARD CEILING FINISHES | SF | 612.000 | 240.000 * |
| 0603 0301 | 5/8" GYPSUM WALL BOARD CEILING, 1 LAYER, FIRE RATED | SF | 240.000 | 240.000 |
| 0603 04 | ACOUSTIC CEILING TILES & PANELS | SF | .000 | 983.000 * |
| 0603 0402 | 2' X 2' OR 2' X 4' FIBERGLASS ACOUSTICAL CEILING TILES | SF | .000 | 983.000 * |
| 0603 07 | SUSPENSION SYSTEMS | SF | .000 | 1,223.000 * |
| 0603 0702 | T-BAR CEILING SUSPENSION SYSTEM 2' X 2' GRID | SF | .000 | 983.000 * |
| 0603 0704 | SUSPENSION SYSTEM FOR GYPSUM BOARD CEILING | SF | .000 | 240.000 * |
| | **LOUNGE AND GAME ROOM** | | | |
| 0601 | WALL FINISHES | SF | 830.000 | 830.000 |
| 0601 03 | GYPSUM WALLBOARD FINISHES | SF | .000 | 320.000 * |
| 0601 0302 | 5/8" GYPSUM BRD ON FURRING CHANNEL W/ RIGID INSULATION | SF | .000 | 320.000 * |
| 0601 05 | PAINTING TO WALL | SF | .000 | 830.000 * |
| 0601 0501 | PAINT TO GYPSUM BOARD WALLS USING ROLLER | SF | .000 | 320.000 * |
| 0601 0502 | PAINT TO CONCRETE BLOCK USING BRUSHES, TWO COATS | SF | .000 | 510.000 * |
| 0601 06 | WALL COVERINGS | SF | 282.000 | .000 * |
| 0602 | FLOORING & FLOOR FINISHES | SF | 577.000 | 577.000 |
| 0602 04 | RESILIENT FLOORING | SF | 289.000 | 577.000 * |
| 0602 0401 | VINYL TILE, 1/8 "X 12" X 12" | SF | 577.000 | 577.000 |

* THIS VALUE WAS INPUT BY THE USER.

NURSING HOME DESIGN MODEL, INPUT PARAMETERS, QTO RUN, DIRECT COSTS

| | | UM | MODEL/ESTIMATED QUANTITY | USER QUANTITY |
|---|---|---|---|---|
| 0602 05 | CARPETING | SF | 289.000 | .000 * |
| 0603 | CEILING & CEILING FINISHES | SF | 577.000 | 577.000 |
| 0603 01 | EXPOSED CONCRETE FINISHES | SF | 289.000 | .000 * |
| 0603 03 | GYPSUM WALLBOARD CEILING FINISHES | SF | 289.000 | .000 * |
| 0603 04 | ACOUSTIC CEILING TILES & PANELS | SF | .000 | 577.000 * |
| 0603 0402 | 2' X 2' OR 2' X 4' FIBERGLASS ACOUSTICAL CEILING TILES | SF | .000 | 577.000 * |
| 0603 07 | SUSPENSION SYSTEMS | SF | .000 | 577.000 * |
| 0603 0702 | T-BAR CEILING SUSPENSION SYSTEM 2' X 2' GRID | SF | .000 | 577.000 * |
| | **NURSING** | | | |
| 0601 | WALL FINISHES | SF | 880.000 | 880.000 |
| 0601 02 | PLASTER WALL FINISHES | SF | 147.000 | .000 * |
| 0601 03 | GYPSUM WALLBOARD FINISHES | SF | 89.000 | .000 * |
| 0601 04 | TILE & TERRAZZO WALL FINISHES | SF | 70.000 | .000 * |
| 0601 05 | PAINTING TO WALL | SF | 385.000 | 880.000 * |
| 0601 0501 | PAINT TO GYPSUM BOARD WALLS USING ROLLER | SF | 880.000 | 620.000 * |
| 0601 0502 | PAINT TO CONCRETE BLOCK USING BRUSHES, TWO COATS | SF | .000 | 260.000 * |
| 0601 06 | WALL COVERINGS | SF | 190.000 | .000 * |
| 0601 08 | SPECIAL COATINGS AND WALL COVERINGS TO WALLS | SF | 20.000 | .000 * |
| 0602 | FLOORING & FLOOR FINISHES | SF | 382.000 | 382.000 |
| 0602 04 | RESILIENT FLOORING | SF | 151.000 | 382.000 * |
| 0602 0401 | VINYL TILE, 1/8 "X 12" X 12" | SF | .000 | 382.000 * |
| 0602 0402 | VINYL TILE 1/8" TRAVERTINE | SF | 382.000 | .000 * |
| 0602 05 | CARPETING | SF | 231.000 | .000 * |
| 0603 | CEILING & CEILING FINISHES | SF | 382.000 | 382.000 |
| 0603 03 | GYPSUM WALLBOARD CEILING FINISHES | SF | 70.000 | .000 * |
| 0603 04 | ACOUSTIC CEILING TILES & PANELS | SF | 312.000 | 382.000 * |
| 0603 0402 | 2' X 2' OR 2' X 4' FIBERGLASS ACOUSTICAL CEILING TILES | SF | 382.000 | 382.000 |
| 0603 06 | PAINTING & STAINING CEILINGS | SF | 70.000 | .000 * |
| 0603 07 | SUSPENSION SYSTEMS | SF | 382.000 | 382.000 |
| 0603 0702 | T-BAR CEILING SUSPENSION SYSTEM 2' X 2' GRID | SF | 312.000 | 382.000 * |
| 0603 0704 | SUSPENSION SYSTEM FOR GYPSUM BOARD CEILING | SF | 70.000 | .000 * |
| | **OFFICE - CLOSED OFFICE SPACE** | | | |
| 0601 | WALL FINISHES | SF | 720.000 | 720.000 |
| 0601 02 | PLASTER WALL FINISHES | SF | .000 | 440.000 * |
| 0601 0201 | 2 COATS OF GYPSUM PLASTER ON 3/8" GYPSUM LATH | SF | .000 | 440.000 * |

* THIS VALUE WAS INPUT BY THE USER.

NURSING HOME DESIGN MODEL, INPUT PARAMETERS, QTO RUN, DIRECT COSTS

| | | UM | MODEL/ESTIMATED QUANTITY | USER QUANTITY |
|---|---|---|---|---|
| 0601 03 | GYPSUM WALLBOARD FINISHES | SF | 41.000 | 500.000 * |
| 0601 0301 | 5/8" GYPSUM BOARD ON 7/8" FURRING CHANNEL | SF | 420.000 | .000 * |
| 0601 0302 | 5/8" GYPSUM BRD ON FURRING CHANNEL W/ RIGID INSULATION | SF | .000 | 500.000 * |
| 0601 0303 | TWO LAYERS OF 5/8" FIRE RESISTANT GYPSUM BOARD | SF | 80.000 | .000 * |
| 0601 05 | PAINTING TO WALL | SF | 702.000 | 720.000 * |
| 0601 0501 | PAINT TO GYPSUM BOARD WALLS USING ROLLER | SF | 720.000 | 500.000 * |
| 0601 0502 | PAINT TO CONCRETE BLOCK USING BRUSHES, TWO COATS | SF | .000 | 220.000 * |
| 0601 06 | WALL COVERINGS | SF | 38.000 | 440.000 * |
| 0601 0601 | LIGHT WEIGHT VINYL WALLCOVERING WITH FABRIC BACKING | SF | 440.000 | 440.000 |
| 0601 07 | ACOUSTICAL TILES & PANELS TO WALLS | SF | 7.000 | .000 * |
| 0602 | FLOORING & FLOOR FINISHES | SF | 557.000 | 557.000 |
| 0602 04 | RESILIENT FLOORING | SF | 54.000 | .000 * |
| 0602 05 | CARPETING | SF | 502.000 | 557.000 * |
| 0602 0501 | COMMERCIAL GRADE 26 OZ. NYLON CARPET | SF | 557.000 | 557.000 |
| 0603 | CEILING & CEILING FINISHES | SF | 557.000 | 557.000 |
| 0603 04 | ACOUSTIC CEILING TILES & PANELS | SF | 557.000 | 557.000 |
| 0603 0402 | 2' X 2' OR 2' X 4' FIBERGLASS ACOUSTICAL CEILING TILES | SF | 557.000 | 557.000 |
| 0603 07 | SUSPENSION SYSTEMS | SF | 557.000 | 557.000 |
| 0603 0703 | T-BAR CEILING SUSPENSION SYSTEM 2' X 4' GRID | SF | 557.000 | 557.000 |
| 0603 0704 | SUSPENSION SYSTEM FOR GYPSUM BOARD CEILING | SF | 13.000 | 13.000 |
| | PUBLIC AREA - WAREHOUSE | | | |
| 0601 | WALL FINISHES | SF | 960.000 | 960.000 |
| 0601 04 | TILE & TERRAZZO WALL FINISHES | SF | .000 | 683.000 * |
| 0601 0401 | 4-1/4" X 4-1/4" CERAMIC TILE TO WALLS | SF | .000 | 683.000 * |
| 0601 05 | PAINTING TO WALL | SF | 96.000 | .000 * |
| 0602 | FLOORING & FLOOR FINISHES | SF | 411.000 | 411.000 |
| 0602 01 | TILE FLOOR FINISHES | SF | .000 | 411.000 * |
| 0602 0101 | THIN SET NATURAL CLAY CERAMIC TILE FLOOR AND BASE | SF | .000 | 411.000 * |
| 0602 04 | RESILIENT FLOORING | SF | 411.000 | .000 * |
| 0603 | CEILING & CEILING FINISHES | SF | 411.000 | 411.000 |
| 0603 03 | GYPSUM WALLBOARD CEILING FINISHES | SF | .000 | 411.000 * |
| 0603 0301 | 5/8" GYPSUM WALL BOARD CEILING, 1 LAYER, FIRE RATED | SF | .000 | 411.000 * |
| 0603 07 | SUSPENSION SYSTEMS | SF | .000 | 411.000 * |
| 0603 0704 | SUSPENSION SYSTEM FOR GYPSUM BOARD CEILING | SF | .000 | 411.000 * |
| | QUARTERS - ENLISTED (544 SF/UNIT) | | | |
| 0601 | WALL FINISHES | SF | 31,030.000 | 31,030.000 |

* THIS VALUE WAS INPUT BY THE USER.

NURSING HOME DESIGN MODEL, INPUT PARAMETERS, QTO RUN, DIRECT COSTS

| | | UM | MODEL/ESTIMATED QUANTITY | USER QUANTITY |
|---|---|---|---|---|
| 0601 03 | GYPSUM WALLBOARD FINISHES | SF | 9,028.000 | 4,790.000 * |
| 0601 0301 | 5/8" GYPSUM BOARD ON 7/8" FURRING CHANNEL | SF | 4,790.000 | .000 * |
| 0601 0302 | 5/8" GYPSUM BRD ON FURRING CHANNEL W/ RIGID INSULATION | SF | .000 | 4,790.000 * |
| 0601 04 | TILE & TERRAZZO WALL FINISHES | SF | 2,991.000 | .000 * |
| 0601 05 | PAINTING TO WALL | SF | 9,028.000 | 31,030.000 * |
| 0601 0501 | PAINT TO GYPSUM BOARD WALLS USING ROLLER | SF | 31,030.000 | 25,036.000 * |
| 0601 0502 | PAINT TO CONCRETE BLOCK USING BRUSHES, TWO COATS | SF | .000 | 5,994.000 * |
| 0601 06 | WALL COVERINGS | SF | 1,212.000 | 5,540.000 * |
| 0601 0601 | LIGHT WEIGHT VINYL WALLCOVERING WITH FABRIC BACKING | SF | .000 | 5,540.000 * |
| 0601 0602 | MEDIUM WEIGHT VINYL WALLCOVERING WITH FABRIC BACKING | SF | 5,540.000 | .000 * |
| 0602 | FLOORING & FLOOR FINISHES | SF | 9,763.000 | 9,763.000 |
| 0602 01 | TILE FLOOR FINISHES | SF | 1,395.000 | .000 * |
| 0602 05 | CARPETING | SF | 6,024.000 | .000 * |
| 0603 | CEILING & CEILING FINISHES | SF | 9,763.000 | 9,763.000 |
| 0603 01 | EXPOSED CONCRETE FINISHES | SF | 5,875.000 | .000 * |
| 0603 03 | GYPSUM WALLBOARD CEILING FINISHES | SF | 3,888.000 | .000 * |
| 0603 04 | ACOUSTIC CEILING TILES & PANELS | SF | .000 | 2,244.000 * |
| 0603 0402 | 2' X 2' OR 2' X 4' FIBERGLASS ACOUSTICAL CEILING TILES | SF | .000 | 2,244.000 * |
| 0603 06 | PAINTING & STAINING CEILINGS | SF | .000 | 7,519.000 * |
| 0603 0601 | PAINTING TO DRYWALL OR PLASTER USING ROLLERS, 2 COATS | SF | .000 | 7,519.000 * |
| 0603 07 | SUSPENSION SYSTEMS | SF | 3,888.000 | 2,244.000 * |
| 0603 0704 | SUSPENSION SYSTEM FOR GYPSUM BOARD CEILING | SF | 2,244.000 | 2,244.000 |

STORAGE - GENERAL PURPOSE

| | | UM | MODEL/ESTIMATED QUANTITY | USER QUANTITY |
|---|---|---|---|---|
| 0601 | WALL FINISHES | SF | 560.000 | 560.000 |
| 0601 03 | GYPSUM WALLBOARD FINISHES | SF | 88.000 | 250.000 * |
| 0601 0301 | 5/8" GYPSUM BOARD ON 7/8" FURRING CHANNEL | SF | 250.000 | .000 * |
| 0601 0302 | 5/8" GYPSUM BRD ON FURRING CHANNEL W/ RIGID INSULATION | SF | .000 | 250.000 * |
| 0601 05 | PAINTING TO WALL | SF | 176.000 | 560.000 * |
| 0601 0501 | PAINT TO GYPSUM BOARD WALLS USING ROLLER | SF | .000 | 250.000 * |
| 0601 0502 | PAINT TO CONCRETE BLOCK USING BRUSHES, TWO COATS | SF | 560.000 | 310.000 * |
| 0602 | FLOORING & FLOOR FINISHES | SF | 423.000 | 423.000 |
| 0602 04 | RESILIENT FLOORING | SF | .000 | 91.000 * |
| 0602 0401 | VINYL TILE, 1/8 "X 12" X 12" | SF | .000 | 91.000 * |
| 0602 09 | OTHER FLOOR FINISHES | SF | 423.000 | .000 * |
| 0603 | CEILING & CEILING FINISHES | SF | 423.000 | 423.000 |
| 0603 04 | ACOUSTIC CEILING TILES & PANELS | SF | .000 | 91.000 * |
| 0603 0402 | 2' X 2' OR 2' X 4' FIBERGLASS ACOUSTICAL CEILING TILES | SF | .000 | 91.000 * |

* THIS VALUE WAS INPUT BY THE USER.

NURSING HOME DESIGN MODEL, INPUT PARAMETERS, QTO RUN, DIRECT COSTS

| | | UM | MODEL/ESTIMATED QUANTITY | USER QUANTITY |
|---|---|---|---|---|
| 0603 06 | PAINTING & STAINING CEILINGS | SF | 423.000 | .000 * |
| 0603 07 | SUSPENSION SYSTEMS | SF | .000 | 91.000 * |
| 0603 0702 | T-BAR CEILING SUSPENSION SYSTEM 2' X 2' GRID | SF | .000 | 91.000 * |

FACILITY TOTAL

| | | | | |
|---|---|---|---|---|
| 0601 | WALL FINISHES | SF | 50,680.000 | 50,680.000 |
| 0601 02 | PLASTER WALL FINISHES | SF | 4,207.000 | 2,100.000 * |
| 0601 0201 | 2 COATS OF GYPSUM PLASTER ON 3/8" GYPSUM LATH | SF | 1,410.000 | 2,100.000 * |
| 0601 03 | GYPSUM WALLBOARD FINISHES | SF | 10,311.000 | 9,725.000 * |
| 0601 0301 | 5/8" GYPSUM BOARD ON 7/8" FURRING CHANNEL | SF | 7,109.000 | .000 * |
| 0601 0302 | 5/8" GYPSUM BRD ON FURRING CHANNEL W/ RIGID INSULATION | SF | .000 | 9,725.000 * |
| 0601 0303 | TWO LAYERS OF 5/8" FIRE RESISTANT GYPSUM BOARD | SF | 387.000 | .000 * |
| 0601 04 | TILE & TERRAZZO WALL FINISHES | SF | 5,481.000 | 2,803.000 * |
| 0601 0401 | 4-1/4" X 4-1/4" CERAMIC TILE TO WALLS | SF | 1,020.000 | 2,803.000 * |
| 0601 05 | PAINTING TO WALL | SF | 19,078.000 | 51,010.000 * |
| 0601 0501 | PAINT TO GYPSUM BOARD WALLS USING ROLLER | SF | 35,892.000 | 31,732.000 * |
| 0601 0502 | PAINT TO CONCRETE BLOCK USING BRUSHES, TWO COATS | SF | 6,518.000 | 14,608.000 * |
| 0601 0506 | EPOXY PAINT TO DRYWALL | SF | 4,670.000 | 4,670.000 |
| 0601 06 | WALL COVERINGS | SF | 6,562.000 | 8,460.000 * |
| 0601 0601 | LIGHT WEIGHT VINYL WALLCOVERING WITH FABRIC BACKING | SF | 440.000 | 8,460.000 * |
| 0601 0602 | MEDIUM WEIGHT VINYL WALLCOVERING WITH FABRIC BACKING | SF | 8,020.000 | .000 * |
| 0601 07 | ACOUSTICAL TILES & PANELS TO WALLS | SF | 7.000 | .000 * |
| 0601 08 | SPECIAL COATINGS AND WALL COVERINGS TO WALLS | SF | 27.000 | .000 * |
| 0602 | FLOORING & FLOOR FINISHES | SF | 23,461.000 | 23,461.000 |
| 0602 01 | TILE FLOOR FINISHES | SF | 3,932.000 | 864.000 * |
| 0602 0101 | THIN SET NATURAL CLAY CERAMIC TILE FLOOR AND BASE | SF | 453.000 | 864.000 * |
| 0602 04 | RESILIENT FLOORING | SF | 1,382.000 | 7,661.000 * |
| 0602 0401 | VINYL TILE, 1/8 "X 12" X 12" | SF | 6,205.000 | 7,661.000 * |
| 0602 0402 | VINYL TILE 1/8" TRAVERTINE | SF | 382.000 | .000 * |
| 0602 05 | CARPETING | SF | 12,852.000 | 2,541.000 * |
| 0602 0501 | COMMERCIAL GRADE 26 OZ. NYLON CARPET | SF | 816.000 | 2,541.000 * |
| 0602 0502 | COMMERCIAL GRADE 35 OZ NYLON | SF | 1,552.000 | .000 * |
| 0602 0503 | COMMERCIAL GRADE 30 OZ. WOOL CARPET | SF | 173.000 | .000 * |
| 0602 06 | MASONRY & STONE FLOORING | SF | 853.000 | .000 * |
| 0602 07 | SPECIAL FLOORING | SF | 891.000 | .000 * |
| 0602 09 | OTHER FLOOR FINISHES | SF | 1,314.000 | .000 * |
| 0603 | CEILING & CEILING FINISHES | SF | 23,461.000 | 23,461.000 |
| 0603 01 | EXPOSED CONCRETE FINISHES | SF | 8,090.000 | .000 * |
| 0603 03 | GYPSUM WALLBOARD CEILING FINISHES | SF | 14,610.000 | 861.000 * |
| 0603 0301 | 5/8" GYPSUM WALL BOARD CEILING, 1 LAYER, FIRE RATED | SF | 240.000 | 861.000 * |

* THIS VALUE WAS INPUT BY THE USER.

NURSING HOME DESIGN MODEL, INPUT PARAMETERS, QTO RUN, DIRECT COSTS

| | | UM | MODEL/ESTIMATED QUANTITY | USER QUANTITY |
|---|---|---|---|---|
| 0603 0302 | 5/8" GYPSUM WALLBOARD CEILING, 3 LAYERS, OVER 8 FT. | SF | 210.000 | .000 * |
| 0603 04 | ACOUSTIC CEILING TILES & PANELS | SF | 8,064.000 | 8,261.000 * |
| 0603 0402 | 2' X 2' OR 2' X 4' FIBERGLASS ACOUSTICAL CEILING TILES | SF | 4,366.000 | 8,261.000 * |
| 0603 06 | PAINTING & STAINING CEILINGS | SF | 2,154.000 | 13,623.000 * |
| 0603 0601 | PAINTING TO DRYWALL OR PLASTER USING ROLLERS, 2 COATS | SF | 6,104.000 | 13,623.000 * |
| 0603 07 | SUSPENSION SYSTEMS | SF | 13,684.000 | 9,122.000 * |
| 0603 0702 | T-BAR CEILING SUSPENSION SYSTEM 2' X 2' GRID | SF | 3,935.000 | 5,460.000 * |
| 0603 0703 | T-BAR CEILING SUSPENSION SYSTEM 2' X 4' GRID | SF | 557.000 | 557.000 |
| 0603 0704 | SUSPENSION SYSTEM FOR GYPSUM BOARD CEILING | SF | 2,341.000 | 3,118.000 * |
| 0603 09 | SPECIAL CEILINGS | SF | 384.000 | 384.000 |
| 0603 0902 | EXTERIOR CANOPY W/FRAMING | SF | 384.000 | 384.000 |
| 07 | SPECIALTIES | | | |
| | ADMIN MODULE - MEDIUM | | | |
| 0701 | GENERAL SPECIALTIES | SF | 642.000 | 642.000 |
| 0701 01 | COMPARTMENTS, CUBICLES, AND TOILET PARTITIONS | EA | 1.000 | .000 * |
| 0701 02 | TOILET & BATH ACCESSORIES | EA | .000 | 3.000 * |
| 0701 0212 | TOILET ACCESSORIES FOR SINGLE TOILET | EA | .000 | 3.000 * |
| 0702 | BUILT-IN SPECIALTIES | SF | 642.000 | 642.000 |
| 0702 02 | CABINETS | LF | 1.000 | .000 * |
| | BUILDING SUPPORT AREA | | | |
| 0701 | GENERAL SPECIALTIES | SF | 6,104.000 | 6,104.000 |
| 0701 01 | COMPARTMENTS, CUBICLES, AND TOILET PARTITIONS | EA | 26.000 | .000 * |
| 0701 02 | TOILET & BATH ACCESSORIES | EA | 3.000 | .000 * |
| 0701 03 | CHALK & TACKBOARDS | SF | 37.000 | .000 * |
| 0701 04 | IDENTIFYING DEVICES | EA | 42.000 | .000 * |
| 0701 06 | SHELVING | LF | 61.000 | .000 * |
| 0702 | BUILT-IN SPECIALTIES | SF | 6,104.000 | 6,104.000 |
| 0702 05 | FIRE EXTINGUISHER CABINETS | EA | .000 | 5.000 * |
| 0702 0502 | FIRE EXTINGUISHER CABINET, 8" X 16" X 38" | EA | .000 | 5.000 * |
| | COVERED EXTERIOR ENTRYWAY | | | |
| 0701 | GENERAL SPECIALTIES | SF | 384.000 | 384.000 |
| 0702 | BUILT-IN SPECIALTIES | SF | 384.000 | 384.000 |

* THIS VALUE WAS INPUT BY THE USER.

NURSING HOME DESIGN MODEL, INPUT PARAMETERS, QTO RUN, DIRECT COSTS

| | | UM | MODEL/ESTIMATED QUANTITY | USER QUANTITY |
|---|---|---|---|---|
| | **DINING AREA; 40-250 PERSON** | | | |
| 0701 | GENERAL SPECIALTIES | SF | 2,995.000 | 2,995.000 |
| 0701 01 | COMPARTMENTS, CUBICLES, AND TOILET PARTITIONS | EA | 1.000 | .000 * |
| 0701 02 | TOILET & BATH ACCESSORIES | EA | 6.000 | .000 * |
| 0702 | BUILT-IN SPECIALTIES | SF | 2,995.000 | 2,995.000 |
| 0702 02 | CABINETS | LF | .000 | 12.000 * |
| 0702 0210 | METAL BASE AND WALL CABINETS | LF | .000 | 12.000 * |
| | **LAUNDRY, STORAGE, AND MAID'S ROOM** | | | |
| 0701 | GENERAL SPECIALTIES | SF | 1,223.000 | 1,223.000 |
| 0701 01 | COMPARTMENTS, CUBICLES, AND TOILET PARTITIONS | EA | 1.000 | .000 * |
| 0701 02 | TOILET & BATH ACCESSORIES | EA | .000 | 5.000 * |
| 0701 0206 | GRAB BARS | EA | .000 | 3.000 * |
| 0701 0212 | TOILET ACCESSORIES FOR SINGLE TOILET | EA | .000 | 2.000 * |
| 0701 06 | SHELVING | LF | 322.000 | 124.000 * |
| 0701 0601 | 10" WIDE STOCK PREFINISHED SHELVES WITH SUPPORTS | LF | 124.000 | 124.000 |
| 0702 | BUILT-IN SPECIALTIES | SF | 1,223.000 | 1,223.000 |
| 0702 01 | COUNTERS | LF | 23.000 | .000 * |
| 0702 02 | CABINETS | LF | .000 | 28.000 * |
| 0702 0210 | METAL BASE AND WALL CABINETS | LF | .000 | 28.000 * |
| | **LOUNGE AND GAME ROOM** | | | |
| 0701 | GENERAL SPECIALTIES | SF | 577.000 | 577.000 |
| 0701 02 | TOILET & BATH ACCESSORIES | EA | 1.000 | .000 * |
| 0702 | BUILT-IN SPECIALTIES | SF | 577.000 | 577.000 |
| 0702 02 | CABINETS | LF | 12.000 | .000 * |
| 0702 05 | FIRE EXTINGUISHER CABINETS | EA | 1.000 | .000 * |
| | **NURSING** | | | |
| 0701 | GENERAL SPECIALTIES | SF | 382.000 | 382.000 |
| 0701 01 | COMPARTMENTS, CUBICLES, AND TOILET PARTITIONS | EA | 1.000 | .000 * |
| 0701 02 | TOILET & BATH ACCESSORIES | EA | .000 | 1.000 * |

* THIS VALUE WAS INPUT BY THE USER.

NURSING HOME DESIGN MODEL, INPUT PARAMETERS, QTO RUN, DIRECT COSTS

| | | UM | MODEL/ESTIMATED QUANTITY | USER QUANTITY |
|---|---|---|---|---|
| 0701 0212 | TOILET ACCESSORIES FOR SINGLE TOILET | EA | .000 | 1.000 * |
| 0702 | BUILT-IN SPECIALTIES | SF | 382.000 | 382.000 |
| 0702 02 | CABINETS | LF | .000 | 28.000 * |
| 0702 0201 | PLASTIC LAMINATE CABINETS WITH COUNTERTOP AND DRAWERS | LF | .000 | 20.000 * |
| 0702 0210 | METAL BASE AND WALL CABINETS | LF | .000 | 8.000 * |
| | OFFICE - CLOSED OFFICE SPACE | | | |
| 0701 | GENERAL SPECIALTIES | SF | 557.000 | 557.000 |
| 0701 03 | CHALK & TACKBOARDS | SF | 4.000 | .000 * |
| 0701 06 | SHELVING | LF | 2.000 | .000 * |
| 0702 | BUILT-IN SPECIALTIES | SF | 557.000 | 557.000 |
| 0702 01 | COUNTERS | LF | 1.000 | .000 * |
| 0702 02 | CABINETS | LF | 1.000 | .000 * |
| | PUBLIC AREA - WAREHOUSE | | | |
| 0701 | GENERAL SPECIALTIES | SF | 411.000 | 411.000 |
| 0701 02 | TOILET & BATH ACCESSORIES | EA | 11.000 | 3.000 * |
| 0701 0201 | TOILET PAPER HOLDER | EA | 1.000 | .000 * |
| 0701 0202 | SANITARY NAPKIN DISPENSER | EA | 1.000 | .000 * |
| 0701 0203 | PAPER TOWEL DISPENSER AND WASTE RECEPTACLE | EA | 1.000 | .000 * |
| 0701 0204 | MEDICINE CABINET | EA | 1.000 | .000 * |
| 0701 0212 | TOILET ACCESSORIES FOR SINGLE TOILET | EA | .000 | 3.000 * |
| 0701 04 | IDENTIFYING DEVICES | EA | 5.000 | .000 * |
| 0702 | BUILT-IN SPECIALTIES | SF | 411.000 | 411.000 |
| 0702 02 | CABINETS | LF | 7.000 | .000 * |
| | QUARTERS - ENLISTED (544 SF/UNIT) | | | |
| 0701 | GENERAL SPECIALTIES | SF | 9,763.000 | 9,763.000 |
| 0701 02 | TOILET & BATH ACCESSORIES | EA | 32.000 | 34.000 * |
| 0701 0212 | TOILET ACCESSORIES FOR SINGLE TOILET | EA | .000 | 34.000 * |
| 0701 0213 | ACCESSORIES FOR TYPICAL ENLISTED OR OFFICER DORM UNIT | EA | 34.000 | .000 * |
| 0701 06 | SHELVING | LF | 792.000 | .000 * |
| 0702 | BUILT-IN SPECIALTIES | SF | 9,763.000 | 9,763.000 |
| 0702 02 | CABINETS | LF | 126.000 | .000 * |

* THIS VALUE WAS INPUT BY THE USER.

NURSING HOME DESIGN MODEL, INPUT PARAMETERS, QTO RUN, DIRECT COSTS

| | | UM | MODEL/ESTIMATED QUANTITY | USER QUANTITY |
|---|---|---|---|---|
| | STORAGE - GENERAL PURPOSE | | | |
| 0701 | GENERAL SPECIALTIES | SF | 423.000 | 423.000 |
| 0701 06 | SHELVING | LF | .000 | 81.000 * |
| 0701 0601 | 10" WIDE STOCK PREFINISHED SHELVES WITH SUPPORTS | LF | .000 | 81.000 * |
| 0702 | BUILT-IN SPECIALTIES | SF | 423.000 | 423.000 |
| | FACILITY TOTAL | | | |
| 0701 | GENERAL SPECIALTIES | SF | 23,461.000 | 23,461.000 |
| 0701 01 | COMPARTMENTS, CUBICLES, AND TOILET PARTITIONS | EA | 30.000 | .000 * |
| 0701 02 | TOILET & BATH ACCESSORIES | EA | 83.000 | 46.000 * |
| 0701 0201 | TOILET PAPER HOLDER | EA | 1.000 | .000 * |
| 0701 0202 | SANITARY NAPKIN DISPENSER | EA | 1.000 | .000 * |
| 0701 0203 | PAPER TOWEL DISPENSER AND WASTE RECEPTACLE | EA | 1.000 | .000 * |
| 0701 0204 | MEDICINE CABINET | EA | 1.000 | .000 * |
| 0701 0206 | GRAB BARS | EA | .000 | 3.000 * |
| 0701 0212 | TOILET ACCESSORIES FOR SINGLE TOILET | EA | .000 | 43.000 * |
| 0701 0213 | ACCESSORIES FOR TYPICAL ENLISTED OR OFFICER DORM UNIT | EA | 34.000 | .000 * |
| 0701 03 | CHALK & TACKBOARDS | SF | 41.000 | .000 * |
| 0701 04 | IDENTIFYING DEVICES | EA | 88.000 | .000 * |
| 0701 06 | SHELVING | LF | 1,265.000 | 205.000 * |
| 0701 0601 | 10" WIDE STOCK PRFFINISHED SHELVES WITH SUPPORTS | LF | 124.000 | 205.000 * |
| 0702 | BUILT-IN SPECIALTIES | SF | 23,461.000 | 23,461.000 |
| 0702 01 | COUNTERS | LF | 24.000 | .000 * |
| 0702 02 | CABINETS | LF | 171.000 | 68.000 * |
| 0702 0201 | PLASTIC LAMINATE CABINETS WITH COUNTERTOP AND DRAWERS | LF | .000 | 20.000 * |
| 0702 0210 | METAL BASE AND WALL CABINETS | LF | .000 | 48.000 * |
| 0702 05 | FIRE EXTINGUISHER CABINETS | EA | 1.000 | 5.000 * |
| 0702 0502 | FIRE EXTINGUISHER CABINET, 8" X 16" X 38" | EA | .000 | 5.000 * |
| 08 | PLUMBING | | | |
| 0801 | DOMESTIC WATER SUPPLY | EA | 113.000 | 113.000 |
| 0801 01 | PIPE & FITTINGS | EA | 113.000 | 113.000 |
| 0801 0101 | COPPER PIPE & FITTINGS | EA | 113.000 | 113.000 |
| 0801 02 | VALVES & HYDRANTS | EA | 53.000 | 53.000 |
| 0801 0201 | VALVES & HYDRANTS | EA | 53.000 | 53.000 |
| 0801 03 | DOMESTIC WATER SUPPLY EQUIPMENT | EA | 1.000 | 3.000 * |

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NURSING HOME DESIGN MODEL, INPUT PARAMETERS, QTO RUN, DIRECT COSTS

| | | UM | MODEL/ESTIMATED QUANTITY | USER QUANTITY |
|---|---|---|---|---|
| 0801 0304 | DOMESTIC WATER SUPPLY EQUIP - 100 GAL., GAS, HOT WATER | EA | .000 | 2.000 * |
| 0801 0306 | DOMESTIC HOT WATER HEATERS | EA | 3.000 | .000 * |
| 0801 0310 | WATER SUPPLY EQUIPMENT - BOOSTER PUMP | EA | .000 | 1.000 * |
| 0801 04 | INSULATION | EA | 113.000 | 113.000 |
| 0801 0401 | FIBERGLASS 1-1/2" PIPE INSULATION WITH VAPOR BARRIER | EA | 113.000 | 113.000 |
| 0802 | SANITARY WASTE & VENT SYSTEM | EA | 129.000 | 129.000 |
| 0802 01 | WASTE PIPE & FITTINGS | EA | 129.000 | 129.000 |
| 0802 0101 | WASTE PIPE & FITTINGS ORDINARY FAC. | EA | 129.000 | 129.000 |
| 0802 02 | VENT PIPE & FITTINGS | EA | 129.000 | 129.000 |
| 0802 0201 | C.I. NO HUB VENT PIPE SYSTM | EA | 129.000 | 129.000 |
| 0802 03 | FLOOR DRAINS | EA | 4.000 | 16.000 * |
| 0802 0301 | FLOOR DRAINS | EA | .000 | 16.000 * |
| 0802 0304 | MEDIUM DUTY AND HEAVY DUTY CAST IRON FLOOR DRAINS, ADTL | EA | 16.000 | .000 * |
| 0803 | RAINWATER DRAINAGE SYSTEM | SF | 26,702.000 | 26,702.000 |
| 0803 01 | PIPE & FITTINGS | LF | 722.000 | .000 * |
| 0803 02 | ROOF DRAINS | EA | 29.000 | .000 * |
| | **ADMIN MODULE - MEDIUM** | | | |
| 0804 | PLUMBING FIXTURES | EA | 4.000 | 4.000 |
| 0804 01 | WATER CLOSETS | EA | 1.000 | 3.000 * |
| 0804 0102 | FLOOR MOUNTED - WATER CLOSET - HANDICAP - TANKTYPE | EA | .000 | 3.000 * |
| 0804 0103 | ELONGATED, FLOOR MOUNTED WATER CLOSET | EA | 3.000 | .000 * |
| 0804 02 | URINALS | EA | 1.000 | .000 * |
| 0804 03 | LAVATORIES | EA | 1.000 | .000 * |
| 0804 06 | DRINKING FOUNTAINS & COOLERS | EA | 1.000 | .000 * |
| | **BUILDING SUPPORT AREA** | | | |
| 0804 | PLUMBING FIXTURES | EA | 2.000 | 2.000 |
| 0804 01 | WATER CLOSETS | EA | 1.000 | .000 * |
| 0804 02 | URINALS | EA | 1.000 | .000 * |
| 0804 03 | LAVATORIES | EA | 1.000 | .000 * |
| 0804 04 | SINKS | EA | 1.000 | .000 * |
| 0804 06 | DRINKING FOUNTAINS & COOLERS | EA | 1.000 | .000 * |
| | **DINING AREA; 40-250 PERSON** | | | |
| 0804 | PLUMBING FIXTURES | EA | 6.000 | 6.000 |

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NURSING HOME DESIGN MODEL, INPUT PARAMETERS, QTO RUN, DIRECT COSTS

| | | UM | MODEL/ESTIMATED QUANTITY | USER QUANTITY |
|---|---|---|---|---|
| 0804 01 | WATER CLOSETS | EA | 2.000 | .000 * |
| 0804 02 | URINALS | EA | 1.000 | .000 * |
| 0804 03 | LAVATORIES | EA | 2.000 | 1.000 * |
| 0804 0303 | WALL HUNG 20" BY 18" WHITE SINGLE BOWL LAVATORY | EA | .000 | 1.000 * |
| 0804 0308 | CAST IRON, WALLHUNG LAVATORY | EA | 1.000 | .000 * |
| 0804 04 | SINKS | EA | 1.000 | .000 * |
| 0804 06 | DRINKING FOUNTAINS & COOLERS | EA | 1.000 | 1.000 |
| 0804 0602 | 14 GPH ELECTRIC WATER COOLER - WALL MOUNTED | EA | .000 | 1.000 * |
| 0804 0603 | HANDICAPPED ELECTRIC WATER COOLER, WALL MOUNTED | EA | 1.000 | .000 * |
| | LAUNDRY, STORAGE, AND MAID'S ROOM | | | |
| 0804 | PLUMBING FIXTURES | EA | 15.000 | 15.000 |
| 0804 01 | WATER CLOSETS | EA | 1.000 | 2.000 * |
| 0804 0101 | FLOOR MOUNTED - WATER CLOSET | EA | 2.000 | 2.000 |
| 0804 03 | LAVATORIES | EA | 1.000 | 3.000 * |
| 0804 0303 | WALL HUNG 20" BY 18" WHITE SINGLE BOWL LAVATORY | EA | .000 | 1.000 * |
| 0804 0307 | WALL HUNG - HANDICAPPED | EA | .000 | 2.000 * |
| 0804 0308 | CAST IRON, WALLHUNG LAVATORY | EA | 3.000 | .000 * |
| 0804 04 | SINKS | EA | 4.000 | 6.000 * |
| 0804 0403 | 25" BY 22" SINGLE BOWL KITCHEN SINK OF STAINLESS STEEL | EA | 2.000 | .000 * |
| 0804 0406 | SERVICE SINK - ENAMELED CAST IRON | EA | .000 | 2.000 * |
| 0804 0407 | JANITOR SINK - FLOOR TYPE | EA | 5.000 | 2.000 * |
| 0804 0408 | WALL HUNG 24" BY 20" JANITORS SINK OF PORCELAIN ENAMEL | EA | .000 | 1.000 * |
| 0804 0409 | CORNER STYLE FLOOR MOUNTED 28" BY 28" JANITORS SINK | EA | .000 | 1.000 * |
| 0804 05 | SHOWERS/TUBS | EA | .000 | 2.000 * |
| 0804 0502 | SHOWER VALVE, DRAIN FOR CERAMIC TILE SHOWER | EA | .000 | 2.000 * |
| | NURSING | | | |
| 0804 | PLUMBING FIXTURES | EA | 4.000 | 4.000 |
| 0804 01 | WATER CLOSETS | EA | 1.000 | 1.000 |
| 0804 0103 | ELONGATED, FLOOR MOUNTED WATER CLOSET | EA | 1.000 | 1.000 |
| 0804 03 | LAVATORIES | EA | 1.000 | 1.000 |
| 0804 0303 | WALL HUNG 20" BY 18" WHITE SINGLE BOWL LAVATORY | EA | .000 | 1.000 * |
| 0804 0306 | VITREOUS CHINA WALL HUNG LAVATORY WITH ROUGH-IN | EA | 1.000 | .000 * |
| 0804 04 | SINKS | EA | 1.000 | 1.000 |
| 0804 0404 | MEDICAL SINKS | EA | 1.000 | .000 * |
| 0804 0406 | SERVICE SINK - ENAMELED CAST IRON | EA | .000 | 1.000 * |
| 0804 05 | SHOWERS/TUBS | EA | 1.000 | .000 * |
| 0804 06 | DRINKING FOUNTAINS & COOLERS | EA | .000 | 1.000 * |
| 0804 0602 | 14 GPH ELECTRIC WATER COOLER - WALL MOUNTED | EA | .000 | 1.000 * |

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NURSING HOME DESIGN MODEL, INPUT PARAMETERS, QTO RUN, DIRECT COSTS

| | | UM | MODEL/ESTIMATED QUANTITY | USER QUANTITY |
|---|---|---|---|---|
| 0804 0604 | ELECTRIC WALL HUNG WATER FOUNTAIN | EA | 1.000 | .000 * |
| | PUBLIC AREA - WAREHOUSE | | | |
| 0804 | PLUMBING FIXTURES | EA | 9.000 | 9.000 |
| 0804 01 | WATER CLOSETS | EA | 2.000 | 3.000 * |
| 0804 0102 | FLOOR MOUNTED - WATER CLOSET - HANDICAP - TANKTYPE | EA | .000 | 3.000 * |
| 0804 0103 | ELONGATED, FLOOR MOUNTED WATER CLOSET | EA | 3.000 | .000 * |
| 0804 03 | LAVATORIES | EA | 2.000 | 3.000 * |
| 0804 0307 | WALL HUNG - HANDICAPPED | EA | .000 | 3.000 * |
| 0804 0308 | CAST IRON, WALLHUNG LAVATORY | EA | 3.000 | .000 * |
| 0804 04 | SINKS | EA | 2.000 | .000 * |
| 0804 05 | SHOWERS/TUBS | EA | .000 | 2.000 * |
| 0804 0502 | SHOWER VALVE, DRAIN FOR CERAMIC TILE SHOWER | EA | .000 | 2.000 * |
| 0804 06 | DRINKING FOUNTAINS & COOLERS | EA | 2.000 | .000 * |
| | QUARTERS - *ENLISTED* (544 SF/UNIT) | | | |
| 0804 | PLUMBING FIXTURES | EA | 73.000 | 73.000 |
| 0804 01 | WATER CLOSETS | EA | 18.000 | 34.000 * |
| 0804 0101 | FLOOR MOUNTED - WATER CLOSET | EA | 34.000 | .000 * |
| 0804 0104 | WALL MOUNTED - WATER CLOSET | EA | .000 | 34.000 * |
| 0804 03 | LAVATORIES | EA | 37.000 | 34.000 * |
| 0804 0303 | WALL HUNG 20" BY 18" WHITE SINGLE BOWL LAVATORY | EA | .000 | 34.000 * |
| 0804 0304 | 26" BY 18" WHITE OVAL LAVATORY | EA | 34.000 | .000 * |
| 0804 05 | SHOWERS/TUBS | EA | 18.000 | 5.000 * |
| 0804 0502 | SHOWER VALVE, DRAIN FOR CERAMIC TILE SHOWER | EA | .000 | 5.000 * |
| 0804 0505 | PORCELAIN ENAMELED STEEL BATHTUB | EA | 5.000 | .000 * |
| | FACILITY TOTAL | | | |
| 0804 | PLUMBING FIXTURES | EA | 113.000 | 113.000 |
| 0804 01 | WATER CLOSETS | EA | 26.000 | 43.000 * |
| 0804 0101 | FLOOR MOUNTED - WATER CLOSET | EA | 36.000 | 2.000 * |
| 0804 0102 | FLOOR MOUNTED - WATER CLOSET - HANDICAP - TANKTYPE | EA | .000 | 6.000 * |
| 0804 0103 | ELONGATED, FLOOR MOUNTED WATER CLOSET | EA | 7.000 | 1.000 * |
| 0804 0104 | WALL MOUNTED - WATER CLOSET | EA | .000 | 34.000 * |
| 0804 02 | URINALS | EA | 3.000 | .000 * |
| 0804 03 | LAVATORIES | EA | 48.000 | 42.000 * |
| 0804 0303 | WALL HUNG 20" BY 18" WHITE SINGLE BOWL LAVATORY | EA | .000 | 37.000 * |
| 0804 0304 | 26" BY 18" WHITE OVAL LAVATORY | EA | 34.000 | .000 * |

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NURSING HOME DESIGN MODEL, INPUT PARAMETERS, QTO RUN, DIRECT COSTS

| | | UM | MODEL/ESTIMATED QUANTITY | USER QUANTITY |
|---|---|---|---|---|
| 0804 0306 | VITREOUS CHINA WALL HUNG LAVATORY WITH ROUGH-IN | EA | 1.000 | .000 * |
| 0804 0307 | WALL HUNG - HANDICAPPED | EA | .000 | 5.000 * |
| 0804 0308 | CAST IRON, WALLHUNG LAVATORY | EA | 7.000 | .000 * |
| 0804 04 | SINKS | EA | 9.000 | 7.000 * |
| 0804 0403 | 25" BY 22" SINGLE BOWL KITCHEN SINK OF STAINLESS STEEL | EA | 2.000 | .000 * |
| 0804 0404 | MEDICAL SINKS | EA | 1.000 | .000 * |
| 0804 0406 | SERVICE SINK - ENAMELED CAST IRON | EA | .000 | 3.000 * |
| 0804 0407 | JANITOR SINK - FLOOR TYPE | EA | 5.000 | 2.000 * |
| 0804 0408 | WALL HUNG 24" BY 20" JANITORS SINK OF PORCELAIN ENAMEL | EA | .000 | 1.000 * |
| 0804 0409 | CORNER STYLE FLOOR MOUNTED 28" BY 28" JANITORS SINK | EA | .000 | 1.000 * |
| 0804 05 | SHOWERS/TUBS | EA | 19.000 | 9.000 * |
| 0804 0502 | SHOWER VALVE, DRAIN FOR CERAMIC TILE SHOWER | EA | .000 | 9.000 * |
| 0804 0505 | PORCELAIN ENAMELED STEEL BATHTUB | EA | 5.000 | .000 * |
| 0804 06 | DRINKING FOUNTAINS & COOLERS | EA | 5.000 | 2.000 * |
| 0804 0602 | 14 GPH ELECTRIC WATER COOLER - WALL MOUNTED | EA | .000 | 2.000 * |
| 0804 0603 | HANDICAPPED ELECTRIC WATER COOLER, WALL MOUNTED | EA | 1.000 | .000 * |
| 0804 0604 | ELECTRIC WALL HUNG WATER FOUNTAIN | EA | 1.000 | .000 * |
| 09 | H.V.A.C | | | |
| 0901 | ENERGY SUPPLY | MBH | 654.000 | 654.000 |
| 0901 02 | GAS SUPPLY SYSTEM | MBH | 1,177.000 | 1,177.000 |
| 0901 0205 | 425 MBH GAS SUPPLY | EA | .000 | 1.000 * |
| 0901 0206 | 900 MBH GAS SUPPLY | EA | 1.000 | .000 * |
| 0901 05 | HOT WATER SUPPLY SYSTEM | MBH | 654.000 | 654.000 |
| 0902 | HEAT GENERATING SYSTEM | MBH | 654.000 | 654.000 |
| 0902 01 | STEAM BOILERS AND PIPING | MBH | 654.000 | 654.000 |
| 0902 02 | HOT WATER BOILERS AND PIPING | MBH | 654.000 | 654.000 |
| 0902 0218 | HOT WATER BOILER, 900 MBH, GAS FIRED | EA | 1.000 | .000 * |
| 0902 03 | FURNACES | MBH | 654.000 | 654.000 |
| 0903 | COOLING GENERATING SYSTEM | TONS | 66.290 | 66.290 |
| 0903 01 | CHILLED WATER SYSTEMS | TONS | 66.000 | 66.000 |
| 0903 0107 | 75 TON AIR COOLED RECIP. CHILLER W/MECH. ROOM PIPING | EA | 1.000 | .000 * |
| 0903 02 | DIRECT EXPANSION SYSTEMS | TONS | 66.000 | 66.000 |
| 0904 | DISTRIBUTION SYSTEMS | MBH | 1,449.000 | 1,449.000 |
| 0904 01 | AIR DISTRIBUTION, COOLING AND HEATING | MCFM | 20.895 | 38.895 * |
| 0904 0101 | .3 MCFM FAN COIL UNIT ASSEMBLY | MCFM | 36.390 | .000 * |
| 0904 0116 | 1.6MCFM AHU WITH HEAT COIL & OUTSIDE AIR INTAKE | MCFM | 2.505 | .000 * |
| 0904 0168 | 1.2 MCFM AIR DISTRIBUTION SYSTEM FOR ROOF TOP UNIT | MCFM | .000 | 6.000 * |
| 0904 0169 | 2.0 MCFM AIR DISTRIBUTION SYSTEM FOR ROOF TOP UNIT | MCFM | .000 | 12.000 * |
| 0904 07 | CHILLED WATER DISTRIBUTION SYSTEM | TONS | 59.000 | .000 * |

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NURSING HOME DESIGN MODEL, INPUT PARAMETERS, QTO RUN, DIRECT COSTS

| | | UM | MODEL/ESTIMATED QUANTITY | USER QUANTITY |
|---|---|---|---|---|
| 0905 | TERMINAL & PACKAGE UNITS | MBH | 1,449.000 | 1,449.000 |
| 0905 02 | PACKAGE UNITS | EA | .000 | 46.000 * |
| 0905 0201 | THRU THE WALL HEAT PUMP, .68 MBH | EA | .000 | 34.000 * |
| 0905 0202 | THRU THE WALL HEAT PUMP, .85 MBH | EA | .000 | 1.000 * |
| 0905 0207 | ROOF TOP UNIT 3 TON | EA | .000 | 5.000 * |
| 0905 0208 | ROOF TOP UNIT 5 TON | EA | .000 | 6.000 * |
| 0906 | CONTROLS & INSTRUMENTATION | MBH | 1,449.000 | 1,449.000 |
| 0906 01 | AIR CONDITIONING SYSTEMS | EA | .000 | 11.000 * |
| 0906 0116 | CONTROLS FOR 2 TON AIR CONDITIONING SYSTEM | EA | .000 | 11.000 * |
| 0907 | SYSTEMS TESTING & BALANCING | MBH | 1,449.000 | 1,449.000 |
| 0907 01 | WATER SIDE TESTING & BALANCING, HEATING AND COOLING | EA | 74.000 | 74.000 |
| 0907 0102 | WATER TEST & BALANCE BOILER | EA | 1.000 | .000 * |
| 0907 0105 | WATER, TEST & BALANCE CHILLER | EA | 2.000 | .000 * |
| 0907 0107 | WATER, TEST & BALANCE FAN COIL, FIN TUBE | EA | 70.000 | .000 * |
| 0907 0109 | WATER, TEST & BALANCE PUMP | EA | 2.000 | .000 * |
| 0907 02 | AIR SIDE TESTING & BALANCING, HEATNG, COOLNG & EXH SYST | EA | 213.000 | 213.000 |
| 0907 0201 | TEST & BALANCE, CENT FAN/UTILITY SET | EA | .000 | 13.000 * |
| 0907 0202 | TEST & BALANCE H & V UNIT/IN LINE FAN | EA | 70.000 | .000 * |
| 0907 0204 | TEST & BALANCE ROOF EXHAUST FAN | EA | 2.000 | .000 * |
| 0907 0208 | TEST & BALANCE PACKAGE AC UNIT | EA | .000 | 35.000 * |
| 0907 0211 | TEST & BALANCE VAV BOX | EA | .000 | 11.000 * |
| 0907 0212 | TEST & BALANCE REGISTER AVERAGE CEILING HEIGHT | EA | 141.000 | 131.000 * |
| 0908 | VENTILATING/EXHAUST SYSTEMS | MCFM | 1.524 | 1.524 |
| 0908 01 | EXHAUST DISTRIBUTION SYSTEMS | MCFM | 1.524 | 1.524 |
| 0908 0106 | .60 CFM TOILET EXHAUST SYSTEM | MCFM | .000 | 7.200 * |
| 0908 0107 | BATHROOM EXHAUST SYSTEM 1000 CFM | MCFM | .000 | 1.000 * |
| 0908 0130 | .2 MCFM EXHAUST SYSTEM FOR BOQ | MCFM | .142 | .000 * |
| 0908 0194 | 1.95 MCFM EXHAUST SYSTEM FOR BOQ | MCFM | 1.382 | .000 * |
| 10 | SPECIAL MECHANICAL SYSTEMS | | | |
| 1001 | FIRE PROTECTION | SF | 23,461.000 | 23,461.000 |
| 1001 01 | WATER SUPPLY (FIRE PROTECTION) | EA | 241.000 | 241.000 |
| 1001 0105 | FIRE PROTECTION WATER SUPPLY | EA | 241.000 | 241.000 |
| 1001 02 | SPRINKLERS | EA | 241.000 | 241.000 |
| 1001 0202 | CONCEALED SPRINKLER HEADS, PIPES & FITTINGS -ORD. HAZ. | EA | 241.000 | 241.000 |

ADMIN MODULE - MEDIUM

| | | | | |
|---|---|---|---|---|
| 1002 | OTHER SPECIAL MECHANICAL SYSTEMS | SF | 642.000 | 642.000 |

* THIS VALUE WAS INPUT BY THE USER.

NURSING HOME DESIGN MODEL, INPUT PARAMETERS, QTO RUN, DIRECT COSTS

| | | UM | MODEL/ESTIMATED QUANTITY | USER QUANTITY |
|---|---|---|---|---|
| | BUILDING SUPPORT AREA | | | |
| 1002 | OTHER SPECIAL MECHANICAL SYSTEMS | SF | 6,104.000 | 6,104.000 |
| | COVERED EXTERIOR ENTRYWAY | | | |
| 1002 | OTHER SPECIAL MECHANICAL SYSTEMS | SF | 384.000 | 384.000 |
| | DINING AREA; 40-250 PERSON | | | |
| 1002 | OTHER SPECIAL MECHANICAL SYSTEMS | SF | 2,995.000 | 2,995.000 |
| | LAUNDRY, STORAGE, AND MAID'S ROOM | | | |
| 1002 | OTHER SPECIAL MECHANICAL SYSTEMS | SF | 1,223.000 | 1,223.000 |
| | LOUNGE AND GAME ROOM | | | |
| 1002 | OTHER SPECIAL MECHANICAL SYSTEMS | SF | 577.000 | 577.000 |
| | NURSING | | | |
| 1002 | OTHER SPECIAL MECHANICAL SYSTEMS | SF | 382.000 | 382.000 |
| | OFFICE - CLOSED OFFICE SPACE | | | |
| 1002 | OTHER SPECIAL MECHANICAL SYSTEMS | SF | 557.000 | 557.000 |
| | PUBLIC AREA - WAREHOUSE | | | |
| 1002 | OTHER SPECIAL MECHANICAL SYSTEMS | SF | 411.000 | 411.000 |
| | QUARTERS - ENLISTED (544 SF/UNIT) | | | |
| 1002 | OTHER SPECIAL MECHANICAL SYSTEMS | SF | 9,763.000 | 9,763.000 |

NURSING HOME DESIGN MODEL, INPUT PARAMETERS, QTO RUN, DIRECT COSTS

| | | UM | MODEL/ESTIMATED QUANTITY | USER QUANTITY |
|---|---|---|---|---|
| | **STORAGE - GENERAL PURPOSE** | | | |
| 1002 | OTHER SPECIAL MECHANICAL SYSTEMS | SF | 423.000 | 423.000 |
| | **FACILITY TOTAL** | | | |
| 1002 | OTHER SPECIAL MECHANICAL SYSTEMS | SF | 23,461.000 | 23,461.000 |
| 11 | ELECTRICAL | | | |
| 1101 | SERVICE AND DISTRIBUTION | AMPS | 800.000 | 800.000 |
| 1101 01 | MAIN TRANSFORMER | AMPS | 800.000 | .000 * |
| 1101 02 | SECONDARY | AMPS | 800.000 | .000 * |
| 1101 03 | MAIN SWITCHBOARD | AMPS | 800.000 | 800.000 |
| 1101 0307 | UNGRD 800 AMP MAIN SWITCHBOARD | EA | 1.000 | 1.000 |
| 1101 05 | PANELS | AMPS | 800.000 | 800.000 |
| 1101 0501 | PANELBD 208V 100A 24 CIR MLO W/BKR | EA | 4.000 | .000 * |
| 1101 0502 | PANELBD 208V 100A 30 CIR MLO W/BKR | EA | .000 | 5.000 * |
| 1101 0506 | PANELBD 208V 225A 36 CIR MLO W/BKR | EA | 3.000 | .000 * |
| 1101 0507 | PANELBD 208V 225A 42 CIR MLO W/BKR | EA | 2.000 | 7.000 * |
| 1101 0536 | PANELBD 480V 225A 36 CIR MLO W/BKR | EA | 1.000 | .000 * |
| 1101 0537 | PANELBD 480V 225A 42 CIR MLO W/BKR | EA | 1.000 | .000 * |
| | **ADMIN MODULE - MEDIUM** | | | |
| 1102 | LIGHTING & POWER | SF | 642.000 | 642.000 |
| 1102 01 | BRANCH WIRING | EA | 7.000 | 7.000 |
| 1102 0101 | 120 VOLT, 20 AMP DUPLEX RECEPTACLE - STUD PARTITION | EA | 6.000 | 11.000 * |
| 1102 0116 | 120 VOLT, 30 AMP TWISTLOCK RECEPTACLE | EA | 1.000 | .000 * |
| 1102 02 | LIGHTING EQUIPMENT | EA | 10.000 | 10.000 |
| 1102 0202 | 2' X 4' LAY-IN FLUORESCENT FIXTURE | EA | 9.000 | 9.000 |
| 1102 0220 | CEILING RECESSED INCANDESCENT 100 WATT FIXTURE | EA | 1.000 | 1.000 |
| | **BUILDING SUPPORT AREA** | | | |
| 1102 | LIGHTING & POWER | SF | 6,104.000 | 6,104.000 |
| 1102 01 | BRANCH WIRING | EA | 81.000 | 20.000 * |
| 1102 0101 | 120 VOLT, 20 AMP DUPLEX RECEPTACLE - STUD PARTITION | EA | 5.000 | 19.000 * |
| 1102 0102 | 120 VOLT, 20 AMP DUPLEX RECEPTACLE - MASONRY PARTITION | EA | 4.000 | 15.000 * |

* THIS VALUE WAS INPUT BY THE USER.

NURSING HOME DESIGN MODEL, INPUT PARAMETERS, QTO RUN, DIRECT COSTS

| | | UM | MODEL/ESTIMATED QUANTITY | USER QUANTITY |
|---|---|---|---|---|
| 1102 0107 | 120 VOLT, 15 AMP DUPLEX GROUND FAULT RECEPTACLE | EA | 9.000 | 2.000 * |
| 1102 0137 | EQUIPMENT CONNECTIONS FOR UP TO 10 HP | EA | 1.000 | .000 * |
| 1102 0138 | 480 VOLT EQUIPMENT CONNECTIONS FOR MOTORS - 15 TO 25 HP | EA | 1.000 | .000 * |
| 1102 0139 | 480 VOLT EQUIPMENT CONNECTIONS FOR MOTORS - 30 TO 40 HP | EA | 1.000 | .000 * |
| 1102 02 | LIGHTING EQUIPMENT | EA | 91.000 | 20.000 * |
| 1102 0201 | FOUR FOOT STRIP FLOURESCENT FIXTURE | EA | 2.000 | 39.000 * |
| 1102 0202 | 2' X 4' LAY-IN FLUORESCENT FIXTURE | EA | 15.000 | 6.000 * |
| 1102 0207 | 2' X 4' LAY-IN FLUORESCENT FIXTURE WITH EMERGENCY UNIT | EA | .000 | 7.000 * |
| 1102 0220 | CEILING RECESSED INCANDESCENT 100 WATT FIXTURE | EA | 3.000 | .000 * |
| 1102 0272 | EXIT LIGHT WITH BATTERY BACKUP | EA | .000 | 14.000 * |
| | COVERED EXTERIOR ENTRYWAY | | | |
| 1102 | LIGHTING & POWER | SF | 384.000 | 384.000 |
| 1102 02 | LIGHTING EQUIPMENT | EA | 2.000 | 2.000 |
| 1102 0227 | 175W MERCURY VAPOR WALL PACK | EA | .000 | 9.000 * |
| 1102 0229 | 100W HPS WALL MOUNT | EA | 1.000 | .000 * |
| 1102 0235 | 150 WATT HPS RECESSED FIXTURE | EA | 1.000 | .000 * |
| 1102 0239 | 400W HPS FLOOD LIGHT | EA | .000 | 2.000 * |
| | DINING AREA; 40-250 PERSON | | | |
| 1102 | LIGHTING & POWER | SF | 2,995.000 | 2,995.000 |
| 1102 01 | BRANCH WIRING | EA | 12.000 | 8.000 * |
| 1102 0102 | 120 VOLT, 20 AMP DUPLEX RECEPTACLE - MASONRY PARTITION | EA | 5.000 | 22.000 * |
| 1102 0103 | DUPLEX RECEPTACLE LONG RUN | EA | 2.000 | .000 * |
| 1102 0106 | 120 VOLT, 15 AMP DUPLEX GROUND FAULT RECEPTACLE | EA | .000 | 2.000 * |
| 1102 0136 | EQUIPMENT CONNECTIONS FOR UP TO 5 HP | EA | 1.000 | .000 * |
| 1102 02 | LIGHTING EQUIPMENT | EA | 56.000 | 28.000 * |
| 1102 0201 | FOUR FOOT STRIP FLOURESCENT FIXTURE | EA | 1.000 | .000 * |
| 1102 0202 | 2' X 4' LAY-IN FLUORESCENT FIXTURE | EA | 1.000 | .000 * |
| 1102 0205 | FLORESCENT TROFFER W/ PARABOLIC BAFFLE | EA | 7.000 | 21.000 * |
| 1102 0221 | RECESSED INCANDESCENT SQUARE FIXTURE | EA | 18.000 | 8.000 * |
| 1102 0235 | 150 WATT HPS RECESSED FIXTURE | EA | 1.000 | .000 * |
| 1102 0272 | EXIT LIGHT WITH BATTERY BACKUP | EA | 1.000 | .000 * |
| | LAUNDRY, STORAGE, AND MAID'S ROOM | | | |
| 1102 | LIGHTING & POWER | SF | 1,223.000 | 1,223.000 |
| 1102 01 | BRANCH WIRING | EA | 11.000 | 8.000 * |
| 1102 0102 | 120 VOLT, 20 AMP DUPLEX RECEPTACLE - MASONRY PARTITION | EA | .000 | 13.000 * |

* THIS VALUE WAS INPUT BY THE USER.

NURSING HOME DESIGN MODEL, INPUT PARAMETERS, QTO RUN, DIRECT COSTS

| | | UM | MODEL/ESTIMATED QUANTITY | USER QUANTITY |
|---|---|---|---|---|
| 1102 0103 | DUPLEX RECEPTACLE LONG RUN | EA | 7.000 | .000 * |
| 1102 0107 | 120 VOLT, 15 AMP DUPLEX GROUND FAULT RECEPTACLE | EA | .000 | 14.000 * |
| 1102 0136 | EQUIPMENT CONNECTIONS FOR UP TO 5 HP | EA | 1.000 | 1.000 |
| 1102 0156 | 120V 20A SINGLE POLE SWITCH | EA | 1.000 | 1.000 |
| 1102 02 | LIGHTING EQUIPMENT | EA | 14.000 | 14.000 |
| 1102 0204 | 277 VOLT 2' X 4' FLUORESCENT FIXTURE | EA | 3.000 | 14.000 * |
| 1102 0214 | SURFACE MOUNTED 1' X 4' FLUORESCENT FIXTURE | EA | 3.000 | 1.000 * |
| 1102 0220 | CEILING RECESSED INCANDESCENT 100 WATT FIXTURE | EA | 5.000 | .000 * |
| 1102 0272 | EXIT LIGHT WITH BATTERY BACKUP | EA | 4.000 | .000 * |
| | LOUNGE AND GAME ROOM | | | |
| 1102 | LIGHTING & POWER | SF | 577.000 | 577.000 |
| 1102 01 | BRANCH WIRING | EA | 5.000 | 5.000 |
| 1102 0102 | 120 VOLT, 20 AMP DUPLEX RECEPTACLE - MASONRY PARTITION | EA | .000 | 7.000 * |
| 1102 0103 | DUPLEX RECEPTACLE LONG RUN | EA | 1.000 | .000 * |
| 1102 0108 | DUPLEX GFI RECEPTACLE LONG RUN | EA | 4.000 | .000 * |
| 1102 0138 | 480 VOLT EQUIPMENT CONNECTIONS FOR MOTORS - 15 TO 25 HP | EA | 1.000 | .000 * |
| 1102 0156 | 120V 20A SINGLE POLE SWITCH | EA | 1.000 | .000 * |
| 1102 02 | LIGHTING EQUIPMENT | EA | 5.000 | 5.000 |
| 1102 0230 | 100W MERCURY VAPOR WALLMOUNT | EA | 4.000 | .000 * |
| 1102 0235 | 150 WATT HPS RECESSED FIXTURE | EA | 1.000 | 3.000 * |
| 1102 0272 | EXIT LIGHT WITH BATTERY BACKUP | EA | 1.000 | .000 * |
| 1102 0274 | 6V EMERGENCY BATTERY PACK | EA | 1.000 | .000 * |
| | NURSING | | | |
| 1102 | LIGHTING & POWER | SF | 382.000 | 382.000 |
| 1102 01 | BRANCH WIRING | EA | 5.000 | 5.000 |
| 1102 0101 | 120 VOLT, 20 AMP DUPLEX RECEPTACLE - STUD PARTITION | EA | 2.000 | .000 * |
| 1102 0102 | 120 VOLT, 20 AMP DUPLEX RECEPTACLE - MASONRY PARTITION | EA | .000 | 2.000 * |
| 1102 0106 | 120 VOLT, 15 AMP DUPLEX GROUND FAULT RECEPTACLE | EA | 2.000 | 7.000 * |
| 1102 0116 | 120 VOLT, 30 AMP TWISTLOCK RECEPTACLE | EA | 1.000 | .000 * |
| 1102 0121 | 230 VOLT, 30 AMP RECEPTACLE - STUD PARTITION | EA | 1.000 | .000 * |
| 1102 0136 | EQUIPMENT CONNECTIONS FOR UP TO 5 HP | EA | 1.000 | .000 * |
| 1102 02 | LIGHTING EQUIPMENT | EA | 6.000 | 6.000 |
| 1102 0201 | FOUR FOOT STRIP FLOURESCENT FIXTURE | EA | 1.000 | .000 * |
| 1102 0202 | 2' X 4' LAY-IN FLUORESCENT FIXTURE | EA | 2.000 | 5.000 * |
| 1102 0220 | CEILING RECESSED INCANDESCENT 100 WATT FIXTURE | EA | 1.000 | 1.000 |
| 1102 0222 | RECESSED WALL MOUNTED INCANDESCENT FIXTURE 9" X 4" | EA | 1.000 | .000 * |
| | OFFICE - CLOSED OFFICE SPACE | | | |
| 1102 | LIGHTING & POWER | SF | 557.000 | 557.000 |

* THIS VALUE WAS INPUT BY THE USER.

NURSING HOME DESIGN MODEL, INPUT PARAMETERS, QTO RUN, DIRECT COSTS

| | | UM | MODEL/ESTIMATED QUANTITY | USER QUANTITY |
|---|---|---|---|---|
| 1102 01 | BRANCH WIRING | EA | 11.000 | 9.000 * |
| 1102 0101 | 120 VOLT, 20 AMP DUPLEX RECEPTACLE - STUD PARTITION | EA | 8.000 | .000 * |
| 1102 0102 | 120 VOLT, 20 AMP DUPLEX RECEPTACLE - MASONRY PARTITION | EA | 1.000 | 4.000 * |
| 1102 0121 | 230 VOLT, 30 AMP RECEPTACLE - STUD PARTITION | EA | 1.000 | .000 * |
| 1102 02 | LIGHTING EQUIPMENT | EA | 11.000 | 11.000 |
| 1102 0202 | 2' X 4' LAY-IN FLUORESCENT FIXTURE | EA | 10.000 | 14.000 * |
| 1102 0220 | CEILING RECESSED INCANDESCENT 100 WATT FIXTURE | EA | 1.000 | .000 * |
| | PUBLIC AREA - WAREHOUSE | | | |
| 1102 | LIGHTING & POWER | SF | 411.000 | 411.000 |
| 1102 01 | BRANCH WIRING | EA | 21.000 | 2.000 * |
| 1102 0102 | 120 VOLT, 20 AMP DUPLEX RECEPTACLE - MASONRY PARTITION | EA | 2.000 | 13.000 * |
| 1102 0107 | 120 VOLT, 15 AMP DUPLEX GROUND FAULT RECEPTACLE | EA | .000 | 2.000 * |
| 1102 02 | LIGHTING EQUIPMENT | EA | 13.000 | 13.000 |
| 1102 0209 | SURFACE MOUNT 2' X 4' FLUORESCENT FIXTURE | EA | 3.000 | 2.000 * |
| 1102 0272 | EXIT LIGHT WITH BATTERY BACKUP | EA | 3.000 | .000 * |
| 1102 0274 | 6V EMERGENCY BATTERY PACK | EA | 3.000 | .000 * |
| 1102 0276 | PORCELAIN LAMP HOLDER | EA | 3.000 | .000 * |
| 1102 0278 | ACCENT WALL FIXTURE, 100W | EA | 3.000 | 3.000 |
| | QUARTERS - ENLISTED (544 SF/UNIT) | | | |
| 1102 | LIGHTING & POWER | SF | 9,763.000 | 9,763.000 |
| 1102 01 | BRANCH WIRING | EA | 349.000 | 170.000 * |
| 1102 0102 | 120 VOLT, 20 AMP DUPLEX RECEPTACLE - MASONRY PARTITION | EA | 108.000 | 68.000 * |
| 1102 0103 | DUPLEX RECEPTACLE LONG RUN | EA | 15.000 | .000 * |
| 1102 0107 | 120 VOLT, 15 AMP DUPLEX GROUND FAULT RECEPTACLE | EA | 15.000 | 34.000 * |
| 1102 0122 | 230 VOLT, 30 AMP RECEPTACLE - MASONRY PARTITION | EA | 15.000 | 34.000 * |
| 1102 0156 | 120V 20A SINGLE POLE SWITCH | EA | 15.000 | 34.000 * |
| 1102 02 | LIGHTING EQUIPMENT | EA | 254.000 | 254.000 |
| 1102 0201 | FOUR FOOT STRIP FLOURESCENT FIXTURE | EA | 32.000 | .000 * |
| 1102 0202 | 2' X 4' LAY-IN FLUORESCENT FIXTURE | EA | .000 | 34.000 * |
| 1102 0211 | 4' 2 LAMP WALL MOUNT FLORESCENT | EA | 64.000 | .000 * |
| 1102 0214 | SURFACE MOUNTED 1' X 4' FLUORESCENT FIXTURE | EA | 64.000 | .000 * |
| 1102 0249 | 150W PENDANT MOUNT INDUSTRIAL FIXTURE | EA | 64.000 | .000 * |
| 1102 0276 | PORCELAIN LAMP HOLDER | EA | 32.000 | 34.000 * |
| | STORAGE - GENERAL PURPOSE | | | |
| 1102 | LIGHTING & POWER | SF | 423.000 | 423.000 |

* THIS VALUE WAS INPUT BY THE USER.

NURSING HOME DESIGN MODEL, INPUT PARAMETERS, QTO RUN, DIRECT COSTS

| | | UM | MODEL/ESTIMATED QUANTITY | USER QUANTITY |
|---|---|---|---|---|
| 1102 01 | BRANCH WIRING | EA | 16.000 | 16.000 |
| 1102 0103 | DUPLEX RECEPTACLE LONG RUN | EA | 15.000 | 7.000 * |
| 1102 0137 | EQUIPMENT CONNECTIONS FOR UP TO 10 HP | EA | 1.000 | .000 * |
| 1102 02 | LIGHTING EQUIPMENT | EA | 10.000 | 10.000 |
| 1102 0203 | 2' X 4' TWO-TUBE TROFFER | EA | 10.000 | 4.000 * |

FACILITY TOTAL

| | | UM | MODEL/ESTIMATED QUANTITY | USER QUANTITY |
|---|---|---|---|---|
| 1102 | LIGHTING & POWER | SF | 23,461.000 | 23,461.000 |
| 1102 01 | BRANCH WIRING | EA | 518.000 | 250.000 * |
| 1102 0101 | 120 VOLT, 20 AMP DUPLEX RECEPTACLE - STUD PARTITION | EA | 21.000 | 21.000 |
| 1102 0102 | 120 VOLT, 20 AMP DUPLEX RECEPTACLE - MASONRY PARTITION | EA | 120.000 | 120.000 |
| 1102 0103 | DUPLEX RECEPTACLE LONG RUN | EA | 40.000 | 40.000 |
| 1102 0106 | 120 VOLT, 15 AMP DUPLEX GROUND FAULT RECEPTACLE | EA | 2.000 | 2.000 |
| 1102 0107 | 120 VOLT, 15 AMP DUPLEX GROUND FAULT RECEPTACLE | EA | 24.000 | 24.000 |
| 1102 0108 | DUPLEX GFI RECEPTACLE LONG RUN | EA | 4.000 | 4.000 |
| 1102 0116 | 120 VOLT, 30 AMP TWISTLOCK RECEPTACLE | EA | 2.000 | 2.000 |
| 1102 0121 | 230 VOLT, 30 AMP RECEPTACLE - STUD PARTITION | EA | 2.000 | 2.000 |
| 1102 0122 | 230 VOLT, 30 AMP RECEPTACLE - MASONRY PARTITION | EA | 15.000 | 15.000 |
| 1102 0136 | EQUIPMENT CONNECTIONS FOR UP TO 5 HP | EA | 3.000 | 3.000 |
| 1102 0137 | EQUIPMENT CONNECTIONS FOR UP TO 10 HP | EA | 2.000 | 2.000 |
| 1102 0138 | 480 VOLT EQUIPMENT CONNECTIONS FOR MOTORS - 15 TO 25 HP | EA | 2.000 | 2.000 |
| 1102 0139 | 480 VOLT EQUIPMENT CONNECTIONS FOR MOTORS - 30 TO 40 HP | EA | 1.000 | 1.000 |
| 1102 0156 | 120V 20A SINGLE POLE SWITCH | EA | 17.000 | 17.000 |
| 1102 02 | LIGHTING EQUIPMENT | EA | 472.000 | 373.000 * |
| 1102 0201 | FOUR FOOT STRIP FLOURESCENT FIXTURE | EA | 36.000 | 36.000 |
| 1102 0202 | 2' X 4' LAY-IN FLUORESCENT FIXTURE | EA | 37.000 | 37.000 |
| 1102 0203 | 2' X 4' TWO-TUBE TROFFER | EA | 10.000 | 10.000 |
| 1102 0204 | 277 VOLT 2' X 4' FLUORESCENT FIXTURE | EA | 3.000 | 3.000 |
| 1102 0205 | FLORESCENT TROFFER W/ PARABOLIC BAFFLE | EA | 7.000 | 7.000 |
| 1102 0207 | 2' X 4' LAY-IN FLUORESCENT FIXTURE WITH EMERGENCY UNIT | EA | .000 | 7.000 * |
| 1102 0209 | SURFACE MOUNT 2' X 4' FLUORESCENT FIXTURE | EA | 3.000 | 3.000 |
| 1102 0211 | 4' 2 LAMP WALL MOUNT FLORESCENT | EA | 64.000 | 64.000 |
| 1102 0214 | SURFACE MOUNTED 1' X 4' FLUORESCENT FIXTURE | EA | 67.000 | 67.000 |
| 1102 0220 | CEILING RECESSED INCANDESCENT 100 WATT FIXTURE | EA | 11.000 | 11.000 |
| 1102 0221 | RECESSED INCANDESCENT SQUARE FIXTURE | EA | 18.000 | 18.000 |
| 1102 0222 | RECESSED WALL MOUNTED INCANDESCENT FIXTURE 9" X 4" | EA | 1.000 | 1.000 |
| 1102 0227 | 175W MERCURY VAPOR WALL PACK | EA | .000 | 9.000 * |
| 1102 0229 | 100W HPS WALL MOUNT | EA | 1.000 | 1.000 |
| 1102 0230 | 100W MERCURY VAPOR WALLMOUNT | EA | 4.000 | 4.000 |
| 1102 0235 | 150 WATT HPS RECESSED FIXTURE | EA | 3.000 | 3.000 |
| 1102 0239 | 400W HPS FLOOD LIGHT | EA | .000 | 2.000 * |
| 1102 0249 | 150W PENDANT MOUNT INDUSTRIAL FIXTURE | EA | 64.000 | 64.000 |

* THIS VALUE WAS INPUT BY THE USER.

NURSING HOME DESIGN MODEL, INPUT PARAMETERS, QTO RUN, DIRECT COSTS

| | | UM | MODEL/ESTIMATED QUANTITY | USER QUANTITY |
|---|---|---|---|---|
| 1102 0272 | EXIT LIGHT WITH BATTERY BACKUP | EA | 9.000 | 9.000 |
| 1102 0274 | 6V EMERGENCY BATTERY PACK | EA | 4.000 | 4.000 |
| 1102 0276 | PORCELAIN LAMP HOLDER | EA | 35.000 | 35.000 |
| 1102 0278 | ACCENT WALL FIXTURE, 100W | EA | 3.000 | 3.000 |
| 12 | SPECIAL ELECTRICAL SYSTEMS | | | |
| 1201 | COMMUNICATION & ALARM SYSTEMS | SF | 23,461.000 | 23,461.000 |
| 1201 01 | FIRE ALARM SYSTEMS | OUTLT | 76.000 | 34.000 * |
| 1201 0102 | FIRE ALARM SYSTEM - RATE OF RISE HEAT DETECTORS | OUT | 34.000 | 34.000 |
| 1201 0104 | FIRE ALARM DUCT SMOKE DETECTOR | EA | 1.000 | 1.000 |
| 1201 0118 | 12-ZONE FACP WITH ANNUM AND TRANSMITTER | EA | 1.000 | 1.000 |
| 1201 03 | TELEPHONE SYSTEMS | OUTLT | 26.000 | .000 * |
| 1201 07 | TELEVISION SYSTEMS | OUTLT | 27.000 | .000 * |
| 1202 | OTHER SPECIAL ELECTRICAL SYSTEMS | SF | 23,461.000 | 23,461.000 |
| 13 | EQUIPMENT | | | |
| | ADMIN MODULE - MEDIUM | | | |
| 1301 | COMMON FIXED & MOVEABLE EQUIPMENT | SF | 642.000 | 642.000 |
| 1302 | SPECIALIZED FIXED & MOVEABLE EQUIPMENT | SF | 642.000 | 642.000 |
| 1303 | FURNISHINGS | SF | 642.000 | 642.000 |
| 1304 | SPECIAL CONSTRUCTION | SF | 642.000 | 642.000 |
| | BUILDING SUPPORT AREA | | | |
| 1301 | COMMON FIXED & MOVEABLE EQUIPMENT | SF | 6,104.000 | 6,104.000 |
| 1302 | SPECIALIZED FIXED & MOVEABLE EQUIPMENT | SF | 6,104.000 | 6,104.000 |
| 1303 | FURNISHINGS | SF | 6,104.000 | 6,104.000 |
| 1304 | SPECIAL CONSTRUCTION | SF | 6,104.000 | 6,104.000 |
| | COVERED EXTERIOR ENTRYWAY | | | |
| 1301 | COMMON FIXED & MOVEABLE EQUIPMENT | SF | 384.000 | 384.000 |

* THIS VALUE WAS INPUT BY THE USER.

NURSING HOME DESIGN MODEL, INPUT PARAMETERS, QTO RUN, DIRECT COSTS

| | | UM | MODEL/ESTIMATED QUANTITY | USER QUANTITY |
|---|---|---|---|---|
| 1302 | SPECIALIZED FIXED & MOVEABLE EQUIPMENT | SF | 384.000 | 384.000 |
| 1303 | FURNISHINGS | SF | 384.000 | 384.000 |
| 1304 | SPECIAL CONSTRUCTION | SF | 384.000 | 384.000 |
| | DINING AREA; 40-250 PERSON | | | |
| 1301 | COMMON FIXED & MOVEABLE EQUIPMENT | SF | 2,995.000 | 2,995.000 |
| 1302 | SPECIALIZED FIXED & MOVEABLE EQUIPMENT | SF | 2,995.000 | 2,995.000 |
| 1303 | FURNISHINGS | SF | 2,995.000 | 2,995.000 |
| 1304 | SPECIAL CONSTRUCTION | SF | 2,995.000 | 2,995.000 |
| | LAUNDRY, STORAGE, AND MAID'S ROOM | | | |
| 1301 | COMMON FIXED & MOVEABLE EQUIPMENT | SF | 1,223.000 | 1,223.000 |
| 1302 | SPECIALIZED FIXED & MOVEABLE EQUIPMENT | SF | 1,223.000 | 1,223.000 |
| 1303 | FURNISHINGS | SF | 1,223.000 | 1,223.000 |
| 1304 | SPECIAL CONSTRUCTION | SF | 1,223.000 | 1,223.000 |
| | LOUNGE AND GAME ROOM | | | |
| 1301 | COMMON FIXED & MOVEABLE EQUIPMENT | SF | 577.000 | 577.000 |
| 1302 | SPECIALIZED FIXED & MOVEABLE EQUIPMENT | SF | 577.000 | 577.000 |
| 1303 | FURNISHINGS | SF | 577.000 | 577.000 |
| 1304 | SPECIAL CONSTRUCTION | SF | 577.000 | 577.000 |
| | NURSING | | | |
| 1301 | COMMON FIXED & MOVEABLE EQUIPMENT | SF | 382.000 | 382.000 |

NURSING HOME DESIGN MODEL, INPUT PARAMETERS, QTO RUN, DIRECT COSTS

| | | UM | MODEL/ESTIMATED QUANTITY | USER QUANTITY |
|---|---|---|---|---|
| 1302 | SPECIALIZED FIXED & MOVEABLE EQUIPMENT | SF | 382.000 | 382.000 |
| 1302 01 | MEDICAL EQUIPMENT | EA | 386.000 | 386.000 |
| 1303 | FURNISHINGS | SF | 382.000 | 382.000 |
| 1304 | SPECIAL CONSTRUCTION | SF | 382.000 | 382.000 |
| | OFFICE - CLOSED OFFICE SPACE | | | |
| 1301 | COMMON FIXED & MOVEABLE EQUIPMENT | SF | 557.000 | 557.000 |
| 1302 | SPECIALIZED FIXED & MOVEABLE EQUIPMENT | SF | 557.000 | 557.000 |
| 1303 | FURNISHINGS | SF | 557.000 | 557.000 |
| 1304 | SPECIAL CONSTRUCTION | SF | 557.000 | 557.000 |
| | PUBLIC AREA - WAREHOUSE | | | |
| 1301 | COMMON FIXED & MOVEABLE EQUIPMENT | SF | 411.000 | 411.000 |
| 1302 | SPECIALIZED FIXED & MOVEABLE EQUIPMENT | SF | 411.000 | 411.000 |
| 1303 | FURNISHINGS | SF | 411.000 | 411.000 |
| 1304 | SPECIAL CONSTRUCTION | SF | 411.000 | 411.000 |
| | QUARTERS - ENLISTED (544 SF/UNIT) | | | |
| 1301 | COMMON FIXED & MOVEABLE EQUIPMENT | SF | 9,763.000 | 9,763.000 |
| 1302 | SPECIALIZED FIXED & MUVEABLE EQUIPMENT | SF | 9,763.000 | 9,763.000 |
| 1303 | FURNISHINGS | SF | 9,763.000 | 9,763.000 |
| 1303 02 | WINDOW TREATMENT | SF | 507.000 | 507.000 |
| 1303 0201 | HORIZONTAL BLINDS | SF | 507.000 | .000 * |
| 1304 | SPECIAL CONSTRUCTION | SF | 9,763.000 | 9,763.000 |
| | STORAGE - GENERAL PURPOSE | | | |
| 1301 | COMMON FIXED & MOVEABLE EQUIPMENT | SF | 423.000 | 423.000 |

* THIS VALUE WAS INPUT BY THE USER.

NURSING HOME DESIGN MODEL, INPUT PARAMETERS, QTO RUN, DIRECT COSTS

| | | UM | MODEL/ESTIMATED QUANTITY | USER QUANTITY |
|---|---|---|---|---|
| 1302 | SPECIALIZED FIXED & MOVEABLE EQUIPMENT | SF | 423.000 | 423.000 |
| 1303 | FURNISHINGS | SF | 423.000 | 423.000 |
| 1304 | SPECIAL CONSTRUCTION | SF | 423.000 | 423.000 |
| | FACILITY TOTAL | | | |
| 1301 | COMMON FIXED & MOVEABLE EQUIPMENT | SF | 23,461.000 | 23,461.000 |
| 1302 | SPECIALIZED FIXED & MOVEABLE EQUIPMENT | SF | 23,461.000 | 23,461.000 |
| 1302 01 | MEDICAL EQUIPMENT | EA | 386.000 | 386.000 |
| 1303 | FURNISHINGS | SF | 23,461.000 | 23,461.000 |
| 1303 02 | WINDOW TREATMENT | SF | 507.000 | 507.000 |
| 1303 0201 | HORIZONTAL BLINDS | SF | 507.000 | .000 * |
| 1304 | SPECIAL CONSTRUCTION | SF | 23,461.000 | 23,461.000 |

* END OF REPORT *

NURSING HOME DESIGN MODEL, COMPUTER OUTPUT-SYSTEMS LEVEL, QTO RUN, DIRECT COSTS

| SYSTEM DESCRIPTION | $ MAT (000) | $ LAB (000) | $ EQ (000) | $ TOTAL (000) | % TOT | $/FAC QTY | TOT MH | TOT EH |
|---|---|---|---|---|---|---|---|---|
| 01 SUBSTRUCTURE | 59.2 | 46.7 | 3.6 | 109.5 | 8.6% | 4.67 | 3,722 | 948 |
| 02 SUPERSTRUCTURE | 87.6 | 13.2 | 3.6 | 104.4 | 8.2% | 4.45 | 859 | 225 |
| 03 ROOFING | 39.6 | 19.9 | 0.5 | 60.0 | 4.7% | 2.56 | 1,460 | 346 |
| 04 EXTERIOR CLOSURE | 83.6 | 55.2 | 0.8 | 139.6 | 10.9% | 5.95 | 4,443 | 744 |
| 05 INTERIOR CONSTRUCTION | 108.6 | 87.5 | 1.6 | 197.7 | 15.5% | 8.43 | 6,231 | 1,215 |
| 06 INTERIOR FINISHES | 60.5 | 44.8 | 0.6 | 105.9 | 8.3% | 4.52 | 3,249 | 651 |
| 07 SPECIALTIES | 35.4 | 6.0 | 0.1 | 41.5 | 3.2% | 1.77 | 379 | 99 |
| 08 PLUMBING | 92.0 | 60.5 | 1.6 | 154.1 | 12.1% | 6.57 | 3,647 | 1,139 |
| 09 H.V.A.C | 98.0 | 47.6 | 1.4 | 147.0 | 11.5% | 6.27 | 2,707 | 778 |
| 10 SPECIAL MECHANICAL SYSTEMS | 26.6 | 0.6 | 0.0 | 27.2 | 2.1% | 1.16 | 34 | 10 |
| 11 ELECTRICAL | 79.3 | 87.3 | 0.5 | 167.1 | 13.1% | 7.12 | 4,033 | 376 |
| 12 SPECIAL ELECTRICAL SYSTEMS | 13.5 | 10.4 | 0.1 | 24.0 | 1.9% | 1.02 | 480 | 45 |
| FACILITY TOTAL | 783.9 | 479.9 | 14.4 | 1,278.2 | 100.0% | 54.48 | 31,243 | 6,575 |
| PERCENT OF FACILITY TOTAL | 61.3% | 37.5% | 1.2% | | | | | |

NURSING HOME DESIGN MODEL, COMPUTER OUTPUT-ASSEMBLY LEVEL, QTO RUN, DIRECT COSTS

| SYSTEM/SUBSYSTEM ASSEMBLY DESCRIPTION | $ MAT (000) | $ LAB (000) | $ EQ (000) | $ TOTAL (000) | % TOT | $/FAC QTY | TOT MH | TOT EH |
|---|---|---|---|---|---|---|---|---|
| SYSTEM 01 SUBSTRUCTURE | | | | | | | | |
| SUBSYSTEM 01 STANDARD FOUNDATION | | | | | | | | |
| ASSEMBLY 0102/00 1' X 2' STRIP FOOTING, 3,000 PSI | 15.2 | 9.3 | 0.7 | 25.2 | 41.0% | 1.07 | 721 | 179 |
| ASSEMBLY 0116/00 8" MASONRY WALL FOUNDATION - 24" DEEP WALL | 13.9 | 18.4 | 0.3 | 32.6 | 53.1% | 1.39 | 1,512 | 232 |
| ASSEMBLY 0123/00 8" THICK CONCRETE FOUNDATION WALL 3000 PSI, 60" DEEP | 1.4 | 2.0 | 0.3 | 3.7 | 6.0% | 0.15 | 164 | 51 |
| SUBSYSTEM 01 TOTAL | 30.5 | 29.7 | 1.2 | 61.4 | 56.1% | 2.62 | 2,397 | 461 |
| PERCENT OF SUBSYSTEM TOTAL | 49.7% | 48.4% | 1.9% | | | | | |
| SYSTEM 01 SUBSTRUCTURE | | | | | | | | |
| SUBSYSTEM 03 SLAB ON GRADE | | | | | | | | |
| ASSEMBLY 0101/00 4" STANDARD SLAB ON GRADE | 26.2 | 15.8 | 2.2 | 44.2 | 91.7% | 1.89 | 1,234 | 455 |
| ASSEMBLY 0104/00 7" STANDARD SLAB ON GRADE | 2.5 | 1.2 | 0.2 | 3.9 | 8.1% | 0.16 | 91 | 32 |
| SUBSYSTEM 03 TOTAL | 28.8 | 17.0 | 2.4 | 48.2 | 44.0% | 2.05 | 1,325 | 487 |
| PERCENT OF SUBSYSTEM TOTAL | 59.8% | 35.3% | 4.9% | | | | | |
| SYSTEM 01 TOTAL | 59.2 | 46.7 | 3.6 | 109.5 | 8.6% | 4.67 | 3,722 | 948 |
| PERCENT OF SYSTEM TOTAL | 54.1% | 42.6% | 3.3% | | | | | |
| SYSTEM 02 SUPERSTRUCTURE | | | | | | | | |
| SUBSYSTEM 02 ROOF CONSTRUCTION | | | | | | | | |
| ASSEMBLY 0109/00 SPEC SPAN, STRUCTURAL STL, LIGHT LD, ROOF FRAME W/DECK | 3.4 | 0.9 | 0.1 | 4.4 | 4.2% | 0.19 | 67 | 17 |
| ASSEMBLY 0130/00 WOOD TRUSS ROOF FRAMING W/ 3/4" PLYWD ROOF DECK | 3.1 | 1.6 | 0.3 | 5.0 | 4.8% | 0.21 | 109 | 44 |
| ASSEMBLY 0313/00 PRECAST/PRESTRESSED ROOF MEMBERS | 81.2 | 10.7 | 3.2 | 95.1 | 91.1% | 4.05 | 684 | 163 |
| SUBSYSTEM 02 TOTAL | 87.6 | 13.2 | 3.6 | 104.4 | 100.0% | 4.45 | 859 | 225 |
| PERCENT OF SUBSYSTEM TOTAL | 83.9% | 12.6% | 3.5% | | | | | |
| SYSTEM 02 TOTAL | 87.6 | 13.2 | 3.6 | 104.4 | 8.2% | 4.45 | 859 | 225 |
| PERCENT OF SYSTEM TOTAL | 83.9% | 12.6% | 3.5% | | | | | |
| SYSTEM 03 ROOFING | | | | | | | | |
| SUBSYSTEM 01 ROOFING | | | | | | | | |

[> CONTINUED NEXT PAGE <]

NURSING HOME DESIGN MODEL, COMPUTER OUTPUT-ASSEMBLY LEVEL, QTO RUN, DIRECT COSTS

| SYSTEM/SUBSYSTEM ASSEMBLY DESCRIPTION | $ MAT (000) | $ LAB (000) | $ EQ (000) | $ TOTAL (000) | % TOT | $/FAC QTY | TOT MH | TOT EH |
|---|---|---|---|---|---|---|---|---|
| ASSEMBLY 0103/00 4-PLY BUILT-UP ROOFING WITH FIBERGLASS AND GRAVEL | 5.2 | 2.1 | 0.1 | 7.4 | 12.3% | 0.31 | 182 | 64 |
| ASSEMBLY 0105/00 STRIP SHINGLES, 4" SLOPE, MULTI-LAYERED, CLASS A | 4.1 | 3.6 | 0.0 | 7.7 | 12.8% | 0.33 | 298 | 48 |
| ASSEMBLY 0301/00 RIGID INSULATION 1" THICK | 7.7 | 2.5 | 0.0 | 10.2 | 17.0% | 0.43 | 205 | 33 |
| ASSEMBLY 0303/00 RIGID INSULATION, 2" THICK | 9.7 | 1.7 | 0.0 | 11.4 | 19.0% | 0.48 | 137 | 22 |
| ASSEMBLY 0405/00 MISC. ROOFING ITEMS - 12" GRAVEL STOP | 13.0 | 10.1 | 0.4 | 23.5 | 39.2% | 1.00 | 638 | 180 |
| SUBSYSTEM 01 TOTAL | 39.6 | 19.9 | 0.5 | 60.0 | 100.0% | 2.56 | 1,460 | 346 |
| PERCENT OF SUBSYSTEM TOTAL | 66.0% | 33.2% | 0.8% | | | | | |
| SYSTEM 03 TOTAL | 39.6 | 19.9 | 0.5 | 60.0 | 4.7% | 2.56 | 1,460 | 346 |
| PERCENT OF SYSTEM TOTAL | 66.0% | 33.2% | 0.8% | | | | | |
| SYSTEM 04 EXTERIOR CLOSURE | | | | | | | | |
| SUBSYSTEM 01 EXTERIOR WALLS | | | | | | | | |
| ASSEMBLY 0110/00 8" LOAD BEARING CONCRETE BLOCK EXTERIOR CLOSURE WALL | 43.7 | 40.2 | 0.6 | 84.5 | 87.8% | 3.60 | 3,208 | 539 |
| ASSEMBLY 0702/00 3'-8" HIGH - 2" DIA WELDED PIPE RAILING | 2.8 | 0.2 | 0.0 | 3.0 | 3.1% | 0.13 | 14 | 6 |
| ASSEMBLY 0801/00 GYPSUM PLASTER EXTERIOR SOFFITS | 4.4 | 4.1 | 0.1 | 8.6 | 8.9% | 0.37 | 303 | 84 |
| SUBSYSTEM 01 TOTAL | 51.0 | 44.5 | 0.7 | 96.2 | 68.9% | 4.10 | 3,524 | 628 |
| PERCENT OF SUBSYSTEM TOTAL | 53.0% | 46.3% | 0.7% | | | | | |
| SYSTEM 04 EXTERIOR CLOSURE | | | | | | | | |
| SUBSYSTEM 02 EXTERIOR DOORS | | | | | | | | |
| ASSEMBLY 0201/00 3'0" X 7'0" HOLLOW METAL DOOR | 2.2 | 0.9 | 0.0 | 3.1 | 33.7% | 0.13 | 62 | 15 |
| ASSEMBLY 0203/00 3'4" X 7'2" HOLLOW METAL | 4.2 | 1.8 | 0.0 | 6.0 | 65.2% | 0.26 | 122 | 30 |
| SUBSYSTEM 02 TOTAL | 6.4 | 2.7 | 0.1 | 9.2 | 6.6% | 0.39 | 184 | 45 |
| PERCENT OF SUBSYSTEM TOTAL | 69.6% | 29.3% | 1.1% | | | | | |
| SYSTEM 04 EXTERIOR CLOSURE | | | | | | | | |
| SUBSYSTEM 03 EXTERIOR WINDOWS | | | | | | | | |

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NURSING HOME DESIGN MODEL, COMPUTER OUTPUT-ASSEMBLY LEVEL, QTO RUN, DIRECT COSTS

| SYSTEM/SUBSYSTEM ASSEMBLY DESCRIPTION | $ MAT (000) | $ LAB (000) | $ EQ (000) | $ TOTAL (000) | % TOT | $/FAC QTY | TOT MH | TOT EH |
|---|---|---|---|---|---|---|---|---|
| ASSEMBLY 0110/00 ALUMINUM FRM SLIDING TYPE WINDOW - 3/8" BRONZE | 22.2 | 7.0 | 0.1 | 29.3 | 85.4% | 1.25 | 637 | 61 |
| ASSEMBLY 0112/00 ALUMINUM FRM PROJECTED TYPE WINDOW - 1/4" GREY/BRONZE | 4.0 | 1.1 | 0.0 | 5.1 | 14.9% | 0.22 | 98 | 9 |
| SUBSYSTEM 03 TOTAL | 26.2 | 8.0 | 0.1 | 34.3 | 24.6% | 1.46 | 735 | 71 |
| PERCENT OF SUBSYSTEM TOTAL | 76.4% | 23.3% | 0.3% | | | | | |
| SYSTEM 04 TOTAL | 83.6 | 55.2 | 0.8 | 139.6 | 10.9% | 5.95 | 4,443 | 744 |
| PERCENT OF SYSTEM TOTAL | 59.9% | 39.5% | 0.6% | | | | | |
| SYSTEM 05 INTERIOR CONSTRUCTION | | | | | | | | |
| SUBSYSTEM 01 PARTITIONS | | | | | | | | |
| ASSEMBLY 0106/00 MTL STUD PARTITION 4" - 1/2" GYP BD EA SIDE SOUND RATED | 12.6 | 21.2 | 0.5 | 34.3 | 23.4% | 1.46 | 1,290 | 305 |
| ASSEMBLY 0118/00 8 X 8 X 16 LOAD BEARING CONCRETE MASONRY UNIT WALL | 45.1 | 41.5 | 0.6 | 87.2 | 59.6% | 3.71 | 3,307 | 556 |
| ASSEMBLY 0119/00 8 X 12 X 16 LOAD BRG REINFORCED CONC. MASONRY UNIT WALL | 7.6 | 7.8 | 0.1 | 15.5 | 10.6% | 0.66 | 480 | 74 |
| ASSEMBLY 0402/00 HARDWOOD CUSTOM WALL HANDRAIL W/METAL SUPPORTS | 6.9 | 2.6 | 0.1 | 9.6 | 6.6% | 0.41 | 165 | 41 |
| SUBSYSTEM 01 TOTAL | 72.1 | 73.0 | 1.2 | 146.3 | 74.0% | 6.24 | 5,242 | 976 |
| PERCENT OF SUBSYSTEM TOTAL | 49.3% | 49.9% | 0.8% | | | | | |
| SYSTEM 05 INTERIOR CONSTRUCTION | | | | | | | | |
| SUBSYSTEM 02 INTERIOR DOORS | | | | | | | | |
| ASSEMBLY 0116/00 3-0 X 7-0 S.C. WOOD DOOR W/H.M. FRAME W/PASSAGE SET | 12.6 | 8.0 | 0.2 | 20.8 | 45.0% | 0.89 | 549 | 137 |
| ASSEMBLY 0118/00 4'-0" X 7'-0" WOOD DOOR, HM FRM | 15.6 | 4.7 | 0.1 | 20.4 | 44.2% | 0.87 | 296 | 78 |
| ASSEMBLY 0119/00 6'-0" X 7'-0" PAIR WOOD DOORS, HM FRM | 0.7 | 0.2 | 0.0 | 0.9 | 1.9% | 0.04 | 12 | 3 |
| ASSEMBLY 0406/00 6'-0" X 7'-0" PAIR FIRE RATED WOOD DOORS | 3.4 | 0.8 | 0.0 | 4.2 | 9.1% | 0.18 | 49 | 13 |
| SUBSYSTEM 02 TOTAL | 32.3 | 13.6 | 0.3 | 46.2 | 23.4% | 1.97 | 906 | 231 |
| PERCENT OF SUBSYSTEM TOTAL | 69.9% | 29.4% | 0.7% | | | | | |

SYSTEM 05 INTERIOR CONSTRUCTION
SUBSYSTEM 03 INTERIOR WINDOWS

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NURSING HOME DESIGN MODEL, COMPUTER OUTPUT-ASSEMBLY LEVEL, QTO RUN, DIRECT COSTS

| SYSTEM/SUBSYSTEM ASSEMBLY DESCRIPTION | $ MAT (000) | $ LAB (000) | $ EQ (000) | $ TOTAL (000) | % TOT | $/FAC QTY | TOT MH | TOT EH |
|---|---|---|---|---|---|---|---|---|
| ASSEMBLY 0101/00 FIXED TYPE WINDOW WITH ALUMINUM FRM - 1/4" WIRED GLASS | 0.4 | 0.1 | 0.0 | 0.5 | 9.8% | 0.02 | 5 | 1 |
| ASSEMBLY 0102/00 FIXED TYPE WINDOW WITH ALUMINUM FRM - 1/4 CLEAR GLASS | 3.8 | 0.8 | 0.0 | 4.6 | 90.2% | 0.20 | 77 | 7 |
| SUBSYSTEM 03 TOTAL | 4.2 | 0.9 | 0.0 | 5.1 | 2.6% | 0.22 | 83 | 8 |
| PERCENT OF SUBSYSTEM TOTAL | 82.4% | 17.6% | 0.0% | | | | | |
| SYSTEM 05 TOTAL | 108.6 | 87.5 | 1.6 | 197.7 | 15.5% | 8.43 | 6,231 | 1,215 |
| PERCENT OF SYSTEM TOTAL | 54.9% | 44.3% | 0.8% | | | | | |
| SYSTEM 06 INTERIOR FINISHES | | | | | | | | |
| SUBSYSTEM 01 WALL FINISHES | | | | | | | | |
| ASSEMBLY 0201/00 2 COATS OF GYPSUM PLASTER ON 3/8" GYPSUM LATH | 3.5 | 2.0 | 0.0 | 5.5 | 11.0% | 0.24 | 159 | 46 |
| ASSEMBLY 0302/00 5/8" GYPSUM BRD ON FURRING CHANNEL W/ RIGID INSULATION | 6.2 | 8.3 | 0.1 | 14.6 | 29.3% | 0.62 | 516 | 129 |
| ASSEMBLY 0401/00 4-1/4" X 4-1/4" CERAMIC TILE TO WALLS | 5.3 | 3.8 | 0.0 | 9.1 | 18.2% | 0.39 | 216 | 27 |
| ASSEMBLY 0501/00 PAINT TO GYPSUM BOARD WALLS USING ROLLER | 2.5 | 3.8 | 0.0 | 6.3 | 12.6% | 0.27 | 343 | 73 |
| ASSEMBLY 0502/00 PAINT TO CONCRETE BLOCK USING BRUSHES, TWO COATS | 1.3 | 4.7 | 0.1 | 6.1 | 12.2% | 0.26 | 406 | 88 |
| ASSEMBLY 0506/00 EPOXY PAINT TO DRYWALL | 0.7 | 1.5 | 0.0 | 2.2 | 4.4% | 0.10 | 130 | 28 |
| ASSEMBLY 0601/00 LIGHT WEIGHT VINYL WALLCOVERING WITH FABRIC BACKING | 4.2 | 1.6 | 0.0 | 5.8 | 11.6% | 0.25 | 132 | 13 |
| SUBSYSTEM 01 TOTAL | 23.9 | 25.6 | 0.4 | 49.9 | 47.1% | 2.13 | 1,902 | 404 |
| PERCENT OF SUBSYSTEM TOTAL | 47.9% | 51.3% | 0.8% | | | | | |
| SYSTEM 06 INTERIOR FINISHES | | | | | | | | |
| SUBSYSTEM 02 FLOORING & FLOOR FINISHES | | | | | | | | |
| ASSEMBLY 0101/00 THIN SET NATURAL CLAY CERAMIC TILE FLOOR AND BASE | 3.5 | 2.3 | 0.0 | 5.8 | 18.4% | 0.25 | 130 | 17 |
| ASSEMBLY 0401/00 VINYL TILE, 1/8 "X 12" X 12" | 16.3 | 4.9 | 0.0 | 21.2 | 67.1% | 0.90 | 281 | 36 |
| ASSEMBLY 0501/00 COMMERCIAL GRADE 26 OZ. NYLON CARPET | 3.9 | 0.8 | 0.0 | 4.7 | 14.9% | 0.20 | 81 | 9 |
| SUBSYSTEM 02 TOTAL | 23.6 | 8.0 | 0.0 | 31.6 | 29.8% | 1.35 | 492 | 61 |
| PERCENT OF SUBSYSTEM TOTAL | 74.7% | 25.3% | 0.0% | | | | | |

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NURSING HOME DESIGN MODEL, COMPUTER OUTPUT-ASSEMBLY LEVEL, QTO RUN, DIRECT COSTS

| SYSTEM/SUBSYSTEM ASSEMBLY DESCRIPTION | $ MAT (000) | $ LAB (000) | $ EQ (000) | $ TOTAL (000) | % TOT | $/FAC QTY | TOT MH | TOT EH |
|---|---|---|---|---|---|---|---|---|
| SYSTEM 06 INTERIOR FINISHES | | | | | | | | |
| SUBSYSTEM 03 CEILING & CEILING FINISHES | | | | | | | | |
| ASSEMBLY 0301/00 5/8" GYPSUM WALL BOARD CEILING, 1 LAYER, FIRE RATED | 0.3 | 0.4 | 0.0 | 0.7 | 2.9% | 0.03 | 19 | 5 |
| ASSEMBLY 0402/00 2' X 2' OR 2' X 4' FIBERGLASS ACOUSTICAL CEILING TILES | 2.8 | 1.3 | 0.0 | 4.1 | 16.8% | 0.18 | 82 | 20 |
| ASSEMBLY 0601/00 PAINTING TO DRYWALL OR PLASTER USING ROLLERS, 2 COATS | 1.1 | 1.6 | 0.0 | 2.7 | 11.1% | 0.12 | 147 | 31 |
| ASSEMBLY 0702/00 T-BAR CEILING SUSPENSION SYSTEM 2' X 2' GRID | 2.5 | 1.1 | 0.0 | 3.6 | 14.8% | 0.15 | 68 | 17 |
| ASSEMBLY 0703/00 T-BAR CEILING SUSPENSION SYSTEM 2' X 4' GRID | 0.2 | 0.1 | 0.0 | 0.3 | 1.2% | 0.01 | 6 | 1 |
| ASSEMBLY 0704/00 SUSPENSION SYSTEM FOR GYPSUM BOARD CEILING | 2.6 | 6.1 | 0.2 | 8.9 | 36.5% | 0.38 | 495 | 99 |
| ASSEMBLY 0902/00 EXTERIOR CANOPY W/FRAMING | 3.5 | 0.6 | 0.1 | 4.2 | 17.2% | 0.18 | 38 | 12 |
| SUBSYSTEM 03 TOTAL | 12.9 | 11.3 | 0.2 | 24.4 | 23.0% | 1.04 | 855 | 186 |
| PERCENT OF SUBSYSTEM TOTAL | 52.9% | 46.3% | 0.8% | | | | | |
| SYSTEM 06 TOTAL | 60.5 | 44.8 | 0.6 | 105.9 | 8.3% | 4.52 | 3,249 | 651 |
| PERCENT OF SYSTEM TOTAL | 57.1% | 42.3% | 0.6% | | | | | |
| SYSTEM 07 SPECIALTIES | | | | | | | | |
| SUBSYSTEM 01 GENERAL SPECIALTIES | | | | | | | | |
| ASSEMBLY 0206/00 GRAB BARS | 0.1 | 0.0 | 0.0 | 0.1 | 0.4% | 0.00 | 2 | 0 |
| ASSEMBLY 0212/00 TOILET ACCESSORIES FOR SINGLE TOILET | 23.9 | 3.2 | 0.1 | 27.2 | 95.8% | 1.16 | 201 | 50 |
| ASSEMBLY 0601/00 10" WIDE STOCK PREFINISHED SHELVES WITH SUPPORTS | 0.6 | 0.5 | 0.0 | 1.1 | 3.9% | 0.05 | 29 | 10 |
| SUBSYSTEM 01 TOTAL | 24.6 | 3.7 | 0.1 | 28.4 | 68.4% | 1.21 | 232 | 60 |
| PERCENT OF SUBSYSTEM TOTAL | 86.6% | 13.0% | 0.4% | | | | | |
| SYSTEM 07 SPECIALTIES | | | | | | | | |
| SUBSYSTEM 02 BUILT-IN SPECIALTIES | | | | | | | | |
| ASSEMBLY 0201/00 PLASTIC LAMINATE CABINETS WITH COUNTERTOP AND DRAWERS | 3.2 | 0.3 | 0.0 | 3.5 | 26.3% | 0.15 | 17 | 4 |
| ASSEMBLY 0210/00 METAL BASE AND WALL CABINETS | 7.1 | 1.9 | 0.0 | 9.0 | 67.7% | 0.38 | 117 | 31 |

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NURSING HOME DESIGN MODEL, COMPUTER OUTPUT-ASSEMBLY LEVEL, QTO RUN, DIRECT COSTS

| SYSTEM/SUBSYSTEM ASSEMBLY DESCRIPTION | $ MAT (000) | $ LAB (000) | $ EQ (000) | $ TOTAL (000) | % TOT | $/FAC QTY | TOT MH | TOT EH |
|---|---|---|---|---|---|---|---|---|
| ASSEMBLY 0502/00 FIRE EXTINGUISHER CABINET, 8" X 16" X 38" | 0.6 | 0.2 | 0.0 | 0.8 | 6.0% | 0.03 | 12 | 3 |
| SUBSYSTEM 02 TOTAL | 10.9 | 2.3 | 0.1 | 13.3 | 32.0% | 0.56 | 147 | 38 |
| PERCENT OF SUBSYSTEM TOTAL | 82.0% | 17.3% | 0.7% | | | | | |
| SYSTEM 07 TOTAL | 35.4 | 6.0 | 0.1 | 41.5 | 3.2% | 1.77 | 379 | 99 |
| PERCENT OF SYSTEM TOTAL | 85.3% | 14.5% | 0.2% | | | | | |
| SYSTEM 08 PLUMBING | | | | | | | | |
| SUBSYSTEM 01 DOMESTIC WATER SUPPLY | | | | | | | | |
| ASSEMBLY 0101/00 COPPER PIPE & FITTINGS | 23.7 | 26.6 | 0.8 | 51.1 | 72.5% | 2.18 | 1,461 | 551 |
| ASSEMBLY 0201/00 VALVES & HYDRANTS | 2.3 | 0.8 | 0.0 | 3.1 | 4.4% | 0.13 | 38 | 10 |
| ASSEMBLY 0304/00 DOMESTIC WATER SUPPLY EQUIP - 100 GAL., GAS, HOT WATER | 4.3 | 0.2 | 0.0 | 4.5 | 6.4% | 0.19 | 10 | 3 |
| ASSEMBLY 0310/00 WATER SUPPLY EQUIPMENT - BOOSTER PUMP | 0.3 | 0.0 | 0.0 | 0.3 | 0.4% | 0.01 | 3 | 1 |
| ASSEMBLY 0401/00 FIBERGLASS 1-1/2" PIPE INSULATION WITH VAPOR BARRIER | 8.4 | 3.0 | 0.1 | 11.5 | 16.3% | 0.49 | 269 | 73 |
| SUBSYSTEM 01 TOTAL | 39.0 | 30.6 | 0.9 | 70.5 | 45.7% | 3.01 | 1,780 | 638 |
| PERCENT OF SUBSYSTEM TOTAL | 55.3% | 43.4% | 1.3% | | | | | |
| SYSTEM 08 PLUMBING | | | | | | | | |
| SUBSYSTEM 02 SANITARY WASTE & VENT SYSTEM | | | | | | | | |
| ASSEMBLY 0101/00 WASTE PIPE & FITTINGS ORDINARY FAC. | 12.5 | 11.9 | 0.3 | 24.7 | 78.7% | 1.05 | 728 | 195 |
| ASSEMBLY 0201/00 C.I. NO HUB VENT PIPE SYSTM | 2.5 | 3.2 | 0.1 | 5.8 | 18.5% | 0.25 | 199 | 53 |
| ASSEMBLY 0301/00 FLOOR DRAINS | 0.5 | 0.6 | 0.0 | 1.1 | 3.5% | 0.05 | 39 | 10 |
| SUBSYSTEM 02 TOTAL | 15.5 | 15.6 | 0.3 | 31.4 | 20.4% | 1.34 | 966 | 259 |
| PERCENT OF SUBSYSTEM TOTAL | 49.4% | 49.7% | 0.9% | | | | | |
| SYSTEM 08 PLUMBING | | | | | | | | |
| SUBSYSTEM 04 PLUMBING FIXTURES | | | | | | | | |
| ASSEMBLY 0101/00 FLOOR MOUNTED - WATER CLOSET | 0.2 | 0.1 | 0.0 | 0.3 | 0.6% | 0.02 | 8 | 2 |

[> CONTINUED NEXT PAGE <]

NURSING HOME DESIGN MODEL, COMPUTER OUTPUT-ASSEMBLY LEVEL, QTO RUN, DIRECT COSTS

| SYSTEM/SUBSYSTEM ASSEMBLY DESCRIPTION | $ MAT (000) | $ LAB (000) | $ EQ (000) | $ TOTAL (000) | % TOT | $/FAC QTY | TOT MH | TOT EH |
|---|---|---|---|---|---|---|---|---|
| ASSEMBLY 0102/00 FLOOR MOUNTED - WATER CLOSET - HANDICAP - TANKTYPE | 1.1 | 0.5 | 0.0 | 1.6 | 3.1% | 0.07 | 31 | 8 |
| ASSEMBLY 0103/00 ELONGATED, FLOOR MOUNTED WATER CLOSET | 0.2 | 0.1 | 0.0 | 0.3 | 0.6% | 0.01 | 4 | 1 |
| ASSEMBLY 0104/00 WALL MOUNTED - WATER CLOSET | 13.6 | 3.6 | 0.1 | 17.3 | 33.2% | 0.74 | 228 | 61 |
| ASSEMBLY 0303/00 WALL HUNG 20" BY 18" WHITE SINGLE BOWL LAVATORY | 10.7 | 4.5 | 0.1 | 15.3 | 29.4% | 0.65 | 284 | 76 |
| ASSEMBLY 0307/00 WALL HUNG - HANDICAPPED | 3.4 | 0.3 | 0.0 | 3.7 | 7.1% | 0.16 | 13 | 4 |
| ASSEMBLY 0406/00 SERVICE SINK - ENAMELED CAST IRON | 1.7 | 0.2 | 0.0 | 1.9 | 3.6% | 0.08 | 10 | 3 |
| ASSEMBLY 0407/00 JANITOR SINK - FLOOR TYPE | 1.1 | 0.1 | 0.0 | 1.2 | 2.3% | 0.05 | 9 | 2 |
| ASSEMBLY 0408/00 WALL HUNG 24" BY 20" JANITORS SINK OF PORCELAIN ENAMEL | 0.8 | 0.1 | 0.0 | 0.9 | 1.7% | 0.04 | 8 | 2 |
| ASSEMBLY 0409/00 CORNER STYLE FLOOR MOUNTED 28" BY 28" JANITORS SINK | 0.8 | 0.2 | 0.0 | 1.0 | 1.9% | 0.04 | 14 | 4 |
| ASSEMBLY 0502/00 SHOWER VALVE, DRAIN FOR CERAMIC TILE SHOWER | 3.0 | 4.4 | 0.1 | 7.5 | 14.4% | 0.32 | 284 | 76 |
| ASSEMBLY 0602/00 14 GPH ELECTRIC WATER COOLER - WALL MOUNTED | 0.9 | 0.1 | 0.0 | 1.0 | 1.9% | 0.04 | 9 | 2 |
| SUBSYSTEM 04 TOTAL | 37.5 | 14.3 | 0.3 | 52.1 | 33.8% | 2.22 | 901 | 242 |
| PERCENT OF SUBSYSTEM TOTAL | 72.0% | 27.4% | 0.6% | | | | | |
| SYSTEM 08 TOTAL | 92.0 | 60.5 | 1.6 | 154.1 | 12.1% | 6.57 | 3,647 | 1,139 |
| PERCENT OF SYSTEM TOTAL | 59.7% | 39.3% | 1.0% | | | | | |
| SYSTEM 09 H.V.A.C | | | | | | | | |
| SUBSYSTEM 01 ENERGY SUPPLY | | | | | | | | |
| ASSEMBLY 0205/00 425 MBH GAS SUPPLY | 0.7 | 0.4 | 0.0 | 1.1 | 100.0% | 0.05 | 26 | 7 |
| SUBSYSTEM 01 TOTAL | 0.7 | 0.4 | 0.0 | 1.1 | 0.7% | 0.05 | 26 | 7 |
| PERCENT OF SUBSYSTEM TOTAL | 63.6% | 36.4% | 0.0% | | | | | |
| SYSTEM 09 H.V.A.C | | | | | | | | |
| SUBSYSTEM 04 DISTRIBUTION SYSTEMS | | | | | | | | |
| ASSEMBLY 0168/00 1.2 MCFM AIR DISTRIBUTION SYSTEM FOR ROOF TOP UNIT | 7.5 | 5.9 | 0.1 | 13.5 | 36.0% | 0.58 | 352 | 99 |
| ASSEMBLY 0169/00 2.0 MCFM AIR DISTRIBUTION SYSTEM FOR ROOF TOP UNIT | 13.2 | 10.5 | 0.2 | 23.9 | 63.7% | 1.02 | 611 | 172 |

[> CONTINUED NEXT PAGE <]

NURSING HOME DESIGN MODEL, COMPUTER OUTPUT-ASSEMBLY LEVEL, QTO RUN, DIRECT COSTS

| SYSTEM/SUBSYSTEM ASSEMBLY DESCRIPTION | $ MAT (000) | $ LAB (000) | $ EQ (000) | $ TOTAL (000) | % TOT | $/FAC QTY | TOT MH | TOT EH |
|---|---|---|---|---|---|---|---|---|
| SUBSYSTEM 04 TOTAL | 20.7 | 16.4 | 0.4 | 37.5 | 25.5% | 1.60 | 962 | 271 |
| PERCENT OF SUBSYSTEM TOTAL | 55.2% | 43.7% | 1.1% | | | | | |
| SYSTEM 09 H.V.A.C | | | | | | | | |
| SUBSYSTEM 05 TERMINAL & PACKAGE UNITS | | | | | | | | |
| ASSEMBLY 0201/00 THRU THE WALL HEAT PUMP, .68 MBH | 25.8 | 2.0 | 0.0 | 27.8 | 46.6% | 1.18 | 113 | 31 |
| ASSEMBLY 0202/00 THRU THE WALL HEAT PUMP, .85 MBH | 0.8 | 0.1 | 0.0 | 0.9 | 1.5% | 0.04 | 3 | 1 |
| ASSEMBLY 0207/00 ROOF TOP UNIT 3 TON | 9.1 | 1.1 | 0.2 | 10.4 | 17.4% | 0.44 | 73 | 28 |
| ASSEMBLY 0208/00 ROOF TOP UNIT 5 TON | 18.7 | 1.7 | 0.3 | 20.7 | 34.7% | 0.88 | 110 | 41 |
| SUBSYSTEM 05 TOTAL | 54.3 | 4.8 | 0.5 | 59.6 | 40.5% | 2.54 | 300 | 101 |
| PERCENT OF SUBSYSTEM TOTAL | 91.1% | 8.1% | 0.8% | | | | | |
| SYSTEM 09 H.V.A.C | | | | | | | | |
| SUBSYSTEM 06 CONTROLS & INSTRUMENTATION | | | | | | | | |
| ASSEMBLY 0116/00 CONTROLS FOR 2 TON AIR CONDITIONING SYSTEM | 0.2 | 0.3 | 0.0 | 0.5 | 100.0% | 0.02 | 13 | 0 |
| SUBSYSTEM 06 TOTAL | 0.2 | 0.3 | 0.0 | 0.5 | 0.3% | 0.02 | 13 | 0 |
| PERCENT OF SUBSYSTEM TOTAL | 40.0% | 60.0% | 0.0% | | | | | |
| SYSTEM 09 H.V.A.C | | | | | | | | |
| SUBSYSTEM 07 SYSTEMS TESTING & BALANCING | | | | | | | | |
| ASSEMBLY 0201/00 TEST & BALANCE, CENT FAN/UTILITY SET | 0.0 | 3.1 | 0.1 | 3.2 | 14.9% | 0.13 | 165 | 45 |
| ASSEMBLY 0208/00 TEST & BALANCE PACKAGE AC UNIT | 0.0 | 13.1 | 0.3 | 13.4 | 62.3% | 0.57 | 686 | 198 |
| ASSEMBLY 0211/00 TEST & BALANCE VAV BOX | 0.4 | 0.3 | 0.0 | 0.7 | 3.3% | 0.03 | 18 | 5 |
| ASSEMBLY 0212/00 TEST & BALANCE REGISTER AVERAGE CEILING HEIGHT | 0.0 | 4.2 | 0.1 | 4.3 | 20.0% | 0.18 | 222 | 60 |
| SUBSYSTEM 07 TOTAL | 0.4 | 20.7 | 0.4 | 21.5 | 14.6% | 0.92 | 1,091 | 308 |
| PERCENT OF SUBSYSTEM TOTAL | 1.9% | 96.3% | 1.8% | | | | | |

SYSTEM 09 H.V.A.C
SUBSYSTEM 08 VENTILATING/EXHAUST SYSTEMS

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NURSING HOME DESIGN MODEL, COMPUTER OUTPUT-ASSEMBLY LEVEL, QTO RUN, DIRECT COSTS

| SYSTEM/SUBSYSTEM ASSEMBLY DESCRIPTION | $ MAT (000) | $ LAB (000) | $ EQ (000) | $ TOTAL (000) | % TOT | $/FAC QTY | TOT MH | TOT EH |
|---|---|---|---|---|---|---|---|---|
| ASSEMBLY 0106/00 .60 CFM TOILET EXHAUST SYSTEM | 19.4 | 4.3 | 0.1 | 23.8 | 88.8% | 1.02 | 274 | 79 |
| ASSEMBLY 0107/00 BATHROOM EXHAUST SYSTEM 1000 CFM | 2.3 | 0.6 | 0.0 | 2.9 | 10.8% | 0.12 | 41 | 12 |
| SUBSYSTEM 08 TOTAL | 21.7 | 5.0 | 0.1 | 26.8 | 18.2% | 1.14 | 314 | 91 |
| PERCENT OF SUBSYSTEM TOTAL | 81.0% | 18.7% | 0.3% | | | | | |
| SYSTEM 09 TOTAL | 98.0 | 47.6 | 1.4 | 147.0 | 11.5% | 6.27 | 2,707 | 778 |
| PERCENT OF SYSTEM TOTAL | 66.7% | 32.4% | 0.9% | | | | | |
| SYSTEM 10 SPECIAL MECHANICAL SYSTEMS | | | | | | | | |
| SUBSYSTEM 01 FIRE PROTECTION | | | | | | | | |
| ASSEMBLY 0105/00 FIRE PROTECTION WATER SUPPLY | 5.8 | 0.6 | 0.0 | 6.4 | 23.5% | 0.28 | 34 | 10 |
| ASSEMBLY 0202/00 CONCEALED SPRINKLER HEADS, PIPES & FITTINGS -ORD. HAZ. | 20.7 | 0.0 | 0.0 | 20.7 | 76.1% | 0.88 | 0 | 0 |
| SUBSYSTEM 01 TOTAL | 26.6 | 0.6 | 0.0 | 27.2 | 100.0% | 1.16 | 34 | 10 |
| PERCENT OF SUBSYSTEM TOTAL | 97.8% | 2.2% | 0.0% | | | | | |
| SYSTEM 10 TOTAL | 26.6 | 0.6 | 0.0 | 27.2 | 2.1% | 1.16 | 34 | 10 |
| PERCENT OF SYSTEM TOTAL | 97.8% | 2.2% | 0.0% | | | | | |
| SYSTEM 11 ELECTRICAL | | | | | | | | |
| SUBSYSTEM 01 SERVICE AND DISTRIBUTION | | | | | | | | |
| ASSEMBLY 0307/00 UNGRD 800 AMP MAIN SWITCHBOARD | 35.8 | 3.4 | 0.0 | 39.2 | 57.9% | 1.67 | 146 | 13 |
| ASSEMBLY 0502/00 PANELBD 208V 100A 30 CIR MLO W/BKR | 3.1 | 4.6 | 0.0 | 7.7 | 11.4% | 0.33 | 210 | 20 |
| ASSEMBLY 0507/00 PANELBD 208V 225A 42 CIR MLO W/BKR | 9.7 | 11.0 | 0.1 | 20.8 | 30.7% | 0.88 | 501 | 48 |
| SUBSYSTEM 01 TOTAL | 48.6 | 19.0 | 0.1 | 67.7 | 40.5% | 2.88 | 857 | 81 |
| PERCENT OF SUBSYSTEM TOTAL | 71.8% | 28.1% | 0.1% | | | | | |
| SYSTEM 11 ELECTRICAL | | | | | | | | |
| SUBSYSTEM 02 LIGHTING & POWER | | | | | | | | |
| ASSEMBLY 0101/00 120 VOLT, 20 AMP DUPLEX RECEPTACLE - STUD PARTITION | 0.8 | 2.8 | 0.0 | 3.6 | 3.6% | 0.16 | 131 | 12 |
| ASSEMBLY 0102/00 120 VOLT, 20 AMP DUPLEX RECEPTACLE - MASONRY PARTITION | 4.0 | 14.1 | 0.1 | 18.2 | 18.3% | 0.78 | 652 | 61 |

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NURSING HOME DESIGN MODEL, COMPUTER OUTPUT-ASSEMBLY LEVEL, QTO RUN, DIRECT COSTS

| SYSTEM/SUBSYSTEM ASSEMBLY DESCRIPTION | $ MAT (000) | $ LAB (000) | $ EQ (000) | $ TOTAL (000) | % TOT | $/FAC QTY | TOT MH | TOT EH |
|---|---|---|---|---|---|---|---|---|
| SUBSYSTEM 02 TOTAL | 30.6 | 68.4 | 0.4 | 99.4 | 59.5% | 4.24 | 3,176 | 295 |
| PERCENT OF SUBSYSTEM TOTAL | 30.8% | 68.8% | 0.4% | | | | | |
| SYSTEM 11 TOTAL | 79.3 | 87.3 | 0.5 | 167.1 | 13.1% | 7.12 | 4,033 | 376 |
| PERCENT OF SYSTEM TOTAL | 47.5% | 52.2% | 0.3% | | | | | |
| SYSTEM 12 SPECIAL ELECTRICAL SYSTEMS | | | | | | | | |
| SUBSYSTEM 01 COMMUNICATION & ALARM SYSTEMS | | | | | | | | |
| ASSEMBLY 0102/00 FIRE ALARM SYSTEM - RATE OF RISE HEAT DETECTORS | 3.3 | 8.5 | 0.1 | 11.9 | 49.6% | 0.51 | 397 | 37 |
| ASSEMBLY 0104/00 FIRE ALARM DUCT SMOKE DETECTOR | 0.3 | 0.3 | 0.0 | 0.6 | 2.5% | 0.02 | 13 | 1 |
| ASSEMBLY 0118/00 12-ZONE FACP WITH ANNUM AND TRANSMITTER | 9.9 | 1.6 | 0.0 | 11.5 | 47.9% | 0.49 | 70 | 6 |
| SUBSYSTEM 01 TOTAL | 13.5 | 10.4 | 0.1 | 24.0 | 100.0% | 1.02 | 480 | 45 |
| PERCENT OF SUBSYSTEM TOTAL | 56.3% | 43.3% | 0.4% | | | | | |
| SYSTEM 12 TOTAL | 13.5 | 10.4 | 0.1 | 24.0 | 1.9% | 1.02 | 480 | 45 |
| PERCENT OF SYSTEM TOTAL | 56.3% | 43.3% | 0.4% | | | | | |
| FACILITY TOTAL | 783.9 | 479.9 | 14.4 | 1,278.2 | 100.0% | 54.48 | 31,243 | 6,575 |
| PERCENT OF FACILITY TOTAL | 61.3% | 37.5% | 1.2% | | | | | |

# APPENDIX D

# NURSING HOME DESIGN MODEL, CONSTRUCTION COSTS

NURSING HOME DESIGN MODEL, COMPUTER OUTPUT-SYSTEMS LEVEL, CONSTRUCTION COSTS

| SYSTEM DESCRIPTION | $ MAT (000) | $ LAB (000) | $ EQ (000) | $ TOTAL (000) | % TOT | $/FAC QTY | TOT MH | TOT EH |
|---|---|---|---|---|---|---|---|---|
| 01 SUBSTRUCTURE | 69.7 | 40.8 | 3.9 | 114.4 | 7.5% | 4.88 | 3,722 | 948 |
| 02 SUPERSTRUCTURE | 103.0 | 11.6 | 4.0 | 118.6 | 7.8% | 5.06 | 859 | 225 |
| 03 ROOFING | 46.6 | 17.4 | 0.5 | 64.5 | 4.2% | 2.75 | 1,460 | 346 |
| 04 EXTERIOR CLOSURE | 98.3 | 48.3 | 0.9 | 147.5 | 9.7% | 6.29 | 4,443 | 744 |
| 05 INTERIOR CONSTRUCTION | 127.7 | 76.6 | 1.7 | 206.0 | 13.5% | 8.78 | 6,231 | 1,215 |
| 06 INTERIOR FINISHES | 71.1 | 39.2 | 0.7 | 111.0 | 7.3% | 4.73 | 3,249 | 651 |
| 07 SPECIALTIES | 41.7 | 5.2 | 0.2 | 47.1 | 3.1% | 2.01 | 379 | 99 |
| 08 PLUMBING | 108.2 | 53.0 | 1.7 | 162.9 | 10.7% | 6.94 | 3,647 | 1,139 |
| 09 H.V.A.C | 115.2 | 41.7 | 1.5 | 158.4 | 10.4% | 6.75 | 2,707 | 778 |
| 10 SPECIAL MECHANICAL SYSTEMS | 31.2 | 0.5 | 0.0 | 31.7 | 2.1% | 1.35 | 34 | 10 |
| 11 ELECTRICAL | 93.2 | 76.4 | 0.6 | 170.2 | 11.2% | 7.25 | 4,033 | 376 |
| 12 SPECIAL ELECTRICAL SYSTEMS | 15.8 | 9.1 | 0.1 | 25.0 | 1.6% | 1.07 | 480 | 45 |
| 99 CONTRACTOR OVERHEAD AND PROFIT | 113.4 | 51.7 | 1.9 | 167.0 | 11.0% | 7.12 | 0 | 0 |
| FACILITY TOTAL | 1,035.2 | 471.7 | 17.7 | 1,524.6 | 100.0% | 64.99 | 31,243 | 6,575 |
| PERCENT OF FACILITY TOTAL | 67.9% | 30.9% | 1.2% | | | | | |

NURSING HOME DESIGN MODEL, COMPUTER OUTPUT-ASSEMBLY LEVEL, CONSTRUCTION COSTS

| SYSTEM/SUBSYSTEM ASSEMBLY DESCRIPTION | $ MAT (000) | $ LAB (000) | $ EQ (000) | $ TOTAL (000) | % TOT | $/FAC QTY | TOT MH | TOT EH |
|---|---|---|---|---|---|---|---|---|
| SYSTEM 01 SUBSTRUCTURE | | | | | | | | |
| SUBSYSTEM 01 STANDARD FOUNDATION | | | | | | | | |
| ASSEMBLY 0102/00 1' X 2' STRIP FOOTING, 3,000 PSI | 17.9 | 8.1 | 0.7 | 26.7 | 42.2% | 1.14 | 721 | 179 |
| ASSEMBLY 0116/00 8" MASONRY WALL FOUNDATION - 24" DEEP WALL | 16.4 | 16.1 | 0.3 | 32.8 | 51.9% | 1.40 | 1,512 | 232 |
| ASSEMBLY 0123/00 8" THICK CONCRETE FOUNDATION WALL 3000 PSI, 60" DEEP | 1.6 | 1.7 | 0.3 | 3.6 | 5.7% | 0.16 | 164 | 51 |
| SUBSYSTEM 01 TOTAL | 35.9 | 26.0 | 1.3 | 63.2 | 55.2% | 2.69 | 2,397 | 461 |
| PERCENT OF SUBSYSTEM TOTAL | 56.8% | 41.1% | 2.1% | | | | | |
| SYSTEM 01 SUBSTRUCTURE | | | | | | | | |
| SUBSYSTEM 03 SLAB ON GRADE | | | | | | | | |
| ASSEMBLY 0101/00 4" STANDARD SLAB ON GRADE | 30.8 | 13.9 | 2.4 | 47.1 | 91.8% | 2.01 | 1,234 | 455 |
| ASSEMBLY 0104/00 7" STANDARD SLAB ON GRADE | 3.0 | 1.0 | 0.2 | 4.2 | 8.2% | 0.18 | 91 | 32 |
| SUBSYSTEM 03 TOTAL | 33.8 | 14.9 | 2.6 | 51.3 | 44.8% | 2.19 | 1,325 | 487 |
| PERCENT OF SUBSYSTEM TOTAL | 65.9% | 29.0% | 5.1% | | | | | |
| SYSTEM 01 TOTAL | 69.7 | 40.8 | 3.9 | 114.4 | 7.5% | 4.88 | 3,722 | 948 |
| PERCENT OF SYSTEM TOTAL | 60.9% | 35.7% | 3.4% | | | | | |
| S'STEM 02 SUPERSTRUCTURE | | | | | | | | |
| SUBSYSTEM 02 ROOF CONSTRUCTION | | | | | | | | |
| ASSEMBLY 0109/00 SPEC SPAN, STRUCTURAL STL, LIGHT LD, ROOF FRAME W/DECK | 4.0 | 0.8 | 0.1 | 4.9 | 4.1% | 0.21 | 67 | 17 |
| ASSEMBLY 0130/00 WOOD TRUSS ROOF FRAMING W/ 3/4" PLYWD ROOF DECK | 3.6 | 1.4 | 0.3 | 5.3 | 4.5% | 0.23 | 109 | 44 |
| ASSEMBLY 0313/00 PRECAST/PRESTRESSED ROOF MEMBERS | 95.5 | 9.3 | 3.5 | 108.3 | 91.3% | 4.62 | 684 | 163 |
| SUBSYSTEM 02 TOTAL | 103.0 | 11.6 | 4.0 | 118.6 | 100.0% | 5.06 | 859 | 225 |
| PERCENT OF SUBSYSTEM TOTAL | 86.8% | 9.8% | 3.4% | | | | | |
| SYSTEM 02 TOTAL | 103.0 | 11.6 | 4.0 | 118.6 | 7.8% | 5.06 | 859 | 225 |
| PERCENT OF SYSTEM TOTAL | 86.8% | 9.8% | 3.4% | | | | | |
| SYSTEM 03 ROOFING | | | | | | | | |
| SUBSYSTEM 01 ROOFING | | | | | | | | |

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NURSING HOME DESIGN MODEL, COMPUTER OUTPUT-ASSEMBLY LEVEL, CONSTRUCTION COSTS

| SYSTEM/SUBSYSTEM<br>ASSEMBLY DESCRIPTION | $ MAT (000) | $ LAB (000) | $ EQ (000) | $ TOTAL (000) | % TOT | $/FAC QTY | TOT MH | TOT EH |
|---|---|---|---|---|---|---|---|---|
| ASSEMBLY 0103/00 4-PLY BUILT-UP ROOFING WITH FIBERGLASS AND GRAVEL | 6.1 | 1.8 | 0.1 | 8.0 | 12.4% | 0.34 | 182 | 64 |
| ASSEMBLY 0105/00 STRIP SHINGLES, 4" SLOPE, MULTI-LAYERED, CLASS A | 4.8 | 3.2 | 0.0 | 8.0 | 12.4% | 0.34 | 298 | 48 |
| ASSEMBLY 0301/00 RIGID INSULATION 1" THICK | 9.1 | 2.2 | 0.0 | 11.3 | 17.5% | 0.48 | 205 | 33 |
| ASSEMBLY 0303/00 RIGID INSULATION, 2" THICK | 11.4 | 1.4 | 0.0 | 12.8 | 19.8% | 0.55 | 137 | 22 |
| ASSEMBLY 0405/00 MISC. ROOFING ITEMS - 12" GRAVEL STOP | 15.2 | 8.9 | 0.4 | 24.5 | 38.0% | 1.04 | 638 | 180 |
| SUBSYSTEM 01 TOTAL | 46.6 | 17.4 | 0.5 | 64.5 | 100.0% | 2.75 | 1,460 | 346 |
| PERCENT OF SUBSYSTEM TOTAL | 72.2% | 27.0% | 0.8% | | | | | |
| SYSTEM 03 TOTAL | 46.6 | 17.4 | 0.5 | 64.5 | 4.2% | 2.75 | 1,460 | 346 |
| PERCENT OF SYSTEM TOTAL | 72.2% | 27.0% | 0.8% | | | | | |
| SYSTEM 04 EXTERIOR CLOSURE | | | | | | | | |
| SUBSYSTEM 01 EXTERIOR WALLS | | | | | | | | |
| ASSEMBLY 0110/00 8" LOAD BEARING CONCRETE BLOCK EXTERIOR CLOSURE WALL | 51.4 | 35.2 | 0.6 | 87.2 | 87.4% | 3.72 | 3,208 | 539 |
| ASSEMBLY 0702/00 3'-8" HIGH - 2" DIA WELDED PIPE RAILING | 3.3 | 0.2 | 0.0 | 3.5 | 3.5% | 0.15 | 14 | 6 |
| ASSEMBLY 0801/00 GYPSUM PLASTER EXTERIOR SOFFITS | 5.2 | 3.6 | 0.1 | 8.9 | 8.9% | 0.38 | 303 | 84 |
| SUBSYSTEM 01 TOTAL | 60.0 | 39.0 | 0.8 | 99.8 | 67.7% | 4.25 | 3,524 | 628 |
| PERCENT OF SUBSYSTEM TOTAL | 60.1% | 39.1% | 0.8% | | | | | |
| SYSTEM 04 EXTERIOR CLOSURE | | | | | | | | |
| SUBSYSTEM 02 EXTERIOR DOORS | | | | | | | | |
| ASSEMBLY 0201/00 3'0" X 7'0" HOLLOW METAL DOOR | 2.6 | 0.8 | 0.0 | 3.4 | 33.7% | 0.14 | 62 | 15 |
| ASSEMBLY 0203/00 3'4" X 7'2" HOLLOW METAL | 5.0 | 1.6 | 0.0 | 6.6 | 65.3% | 0.28 | 122 | 30 |
| SUBSYSTEM 02 TOTAL | 7.6 | 2.4 | 0.1 | 10.1 | 6.8% | 0.43 | 184 | 45 |
| PERCENT OF SUBSYSTEM TOTAL | 75.2% | 23.8% | 1.0% | | | | | |
| SYSTEM 04 EXTERIOR CLOSURE | | | | | | | | |
| SUBSYSTEM 03 EXTERIOR WINDOWS | | | | | | | | |

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NURSING HOME DESIGN MODEL, COMPUTER OUTPUT-ASSEMBLY LEVEL, CONSTRUCTION COSTS

| SYSTEM/SUBSYSTEM ASSEMBLY DESCRIPTION | $ MAT (000) | $ LAB (000) | $ EQ (000) | $ TOTAL (000) | % TOT | $/FAC QTY | TOT MH | TOT EH |
|---|---|---|---|---|---|---|---|---|
| ASSEMBLY 0110/00 ALUMINUM FRM SLIDING TYPE WINDOW - 3/8" BRONZE | 26.1 | 6.1 | 0.1 | 32.3 | 85.2% | 1.38 | 637 | 61 |
| ASSEMBLY 0112/00 ALUMINUM FRM PROJECTED TYPE WINDOW - 1/4" GREY/BRONZE | 4.7 | 0.9 | 0.0 | 5.6 | 14.8% | 0.24 | 98 | 9 |
| SUBSYSTEM 03 TOTAL | 30.8 | 7.0 | 0.1 | 37.9 | 25.7% | 1.62 | 735 | 71 |
| PERCENT OF SUBSYSTEM TOTAL | 81.3% | 18.5% | 0.2% | | | | | |
| SYSTEM 04 TOTAL | 98.3 | 48.3 | 0.9 | 147.5 | 9.7% | 6.29 | 4,443 | 744 |
| PERCENT OF SYSTEM TOTAL | 66.6% | 32.7% | 0.7% | | | | | |
| SYSTEM 05 INTERIOR CONSTRUCTION | | | | | | | | |
| SUBSYSTEM 01 PARTITIONS | | | | | | | | |
| ASSEMBLY 0106/00 MTL STUD PARTITION 4" - 1/2" GYP BD EA SIDE SOUND RATED | 14.8 | 18.5 | 0.5 | 33.8 | 22.5% | 1.44 | 1,290 | 305 |
| ASSEMBLY 0118/00 8 X 8 X 16 LOAD BEARING CONCRETE MASONRY UNIT WALL | 53.0 | 36.3 | 0.6 | 89.9 | 59.9% | 3.83 | 3,307 | 556 |
| ASSEMBLY 0119/00 8 X 12 X 16 LOAD BRG REINFORCED CONC. MASONRY UNIT WALL | 9.0 | 6.8 | 0.1 | 15.9 | 10.6% | 0.68 | 480 | 74 |
| ASSEMBLY 0402/00 HARDWOOD CUSTOM WALL HANDRAIL W/METAL SUPPORTS | 8.1 | 2.3 | 0.1 | 10.5 | 7.0% | 0.44 | 165 | 41 |
| SUBSYSTEM 01 TOTAL | 84.8 | 63.9 | 1.3 | 150.0 | 72.8% | 6.40 | 5,242 | 976 |
| PERCENT OF SUBSYSTEM TOTAL | 56.5% | 42.6% | 0.9% | | | | | |
| SYSTEM 05 INTERIOR CONSTRUCTION | | | | | | | | |
| SUBSYSTEM 02 INTERIOR DOORS | | | | | | | | |
| ASSEMBLY 0116/00 3-0 X 7-0 S.C. WOOD DOOR W/H.M. FRAME W/PASSAGE SET | 14.8 | 7.0 | 0.2 | 22.0 | 43.8% | 0.94 | 549 | 137 |
| ASSEMBLY 0118/00 4'-0" X 7'-0" WOOD DOOR, HM FRM | 18.3 | 4.1 | 0.1 | 22.5 | 44.8% | 0.96 | 296 | 78 |
| ASSEMBLY 0119/00 6'-0" X 7'-0" PAIR WOOD DOORS, HM FRM | 0.8 | 0.2 | 0.0 | 1.0 | 2.0% | 0.04 | 12 | 3 |
| ASSEMBLY 0406/00 6'-0" X 7'-0" PAIR FIRE RATED WOOD DOORS | 4.0 | 0.7 | 0.0 | 4.7 | 9.4% | 0.20 | 49 | 13 |
| SUBSYSTEM 02 TOTAL | 38.0 | 11.9 | 0.3 | 50.2 | 24.4% | 2.14 | 906 | 231 |
| PERCENT OF SUBSYSTEM TOTAL | 75.7% | 23.7% | 0.6% | | | | | |

SYSTEM 05 INTERIOR CONSTRUCTION
SUBSYSTEM 03 INTERIOR WINDOWS

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NURSING HOME DESIGN MODEL, COMPUTER OUTPUT-ASSEMBLY LEVEL, CONSTRUCTION COSTS

| SYSTEM/SUBSYSTEM ASSEMBLY DESCRIPTION | $ MAT (000) | $ LAB (000) | $ EQ (000) | $ TOTAL (000) | % TOT | $/FAC QTY | TOT MH | TOT EH |
|---|---|---|---|---|---|---|---|---|
| ASSEMBLY 0101/00 FIXED TYPE WINDOW WITH ALUMINUM FRM - 1/4" WIRED GLASS | 0.4 | 0.0 | 0.0 | 0.4 | 7.0% | 0.02 | 5 | 1 |
| ASSEMBLY 0102/00 FIXED TYPE WINDOW WITH ALUMINUM FRM - 1/4 CLEAR GLASS | 4.5 | 0.7 | 0.0 | 5.2 | 91.2% | 0.22 | 77 | 7 |
| SUBSYSTEM 03 TOTAL | 4.9 | 0.8 | 0.0 | 5.7 | 2.8% | 0.24 | 83 | 8 |
| PERCENT OF SUBSYSTEM TOTAL | 86.0% | 14.0% | 0.0% | | | | | |
| SYSTEM 05 TOTAL | 127.7 | 76.6 | 1.7 | 206.0 | 13.5% | 8.78 | 6,231 | 1,215 |
| PERCENT OF SYSTEM TOTAL | 62.0% | 37.2% | 0.8% | | | | | |
| SYSTEM 06 INTERIOR FINISHES | | | | | | | | |
| SUBSYSTEM 01 WALL FINISHES | | | | | | | | |
| ASSEMBLY 0201/00 2 COATS OF GYPSUM PLASTER ON 3/8" GYPSUM LATH | 4.1 | 1.7 | 0.0 | 5.8 | 11.4% | 0.25 | 159 | 46 |
| ASSEMBLY 0302/00 5/8" GYPSUM BRD ON FURRING CHANNEL W/ RIGID INSULATION | 7.3 | 7.2 | 0.1 | 14.6 | 28.7% | 0.62 | 516 | 129 |
| ASSEMBLY 0401/00 4-1/4" X 4-1/4" CERAMIC TILE TO WALLS | 6.3 | 3.3 | 0.0 | 9.6 | 18.9% | 0.41 | 216 | 27 |
| ASSEMBLY 0501/00 PAINT TO GYPSUM BOARD WALLS USING ROLLER | 3.0 | 3.3 | 0.0 | 6.3 | 12.4% | 0.27 | 343 | 73 |
| ASSEMBLY 0502/00 PAINT TO CONCRETE BLOCK USING BRUSHES, TWO COATS | 1.5 | 4.1 | 0.2 | 5.8 | 11.4% | 0.25 | 406 | 88 |
| ASSEMBLY 0506/00 EPOXY PAINT TO DRYWALL | 0.9 | 1.3 | 0.1 | 2.3 | 4.5% | 0.10 | 130 | 28 |
| ASSEMBLY 0601/00 LIGHT WEIGHT VINYL WALLCOVERING WITH FABRIC BACKING | 5.0 | 1.4 | 0.0 | 6.4 | 12.6% | 0.27 | 132 | 13 |
| SUBSYSTEM 01 TOTAL | 28.1 | 22.4 | 0.4 | 50.9 | 45.9% | 2.17 | 1,902 | 404 |
| PERCENT OF SUBSYSTEM TOTAL | 55.2% | 44.0% | 0.8% | | | | | |
| SYSTEM 06 INTERIOR FINISHES | | | | | | | | |
| SUBSYSTEM 02 FLOORING & FLOOR FINISHES | | | | | | | | |
| ASSEMBLY 0101/00 THIN SET NATURAL CLAY CERAMIC TILE FLOOR AND BASE | 4.1 | 2.0 | 0.0 | 6.1 | 17.5% | 0.26 | 130 | 17 |
| ASSEMBLY 0401/00 VINYL TILE, 1/8 "X 12" X 12" | 19.2 | 4.3 | 0.0 | 23.5 | 67.5% | 1.00 | 281 | 36 |
| ASSEMBLY 0501/00 COMMERCIAL GRADE 26 OZ. NYLON CARPET | 4.5 | 0.7 | 0.0 | 5.2 | 14.9% | 0.22 | 81 | 9 |
| SUBSYSTEM 02 TOTAL | 27.8 | 7.0 | 0.0 | 34.8 | 31.4% | 1.48 | 492 | 61 |
| PERCENT OF SUBSYSTEM TOTAL | 79.9% | 20.1% | 0.0% | | | | | |

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NURSING HOME DESIGN MODEL, COMPUTER OUTPUT-ASSEMBLY LEVEL, CONSTRUCTION COSTS

| SYSTEM/SUBSYSTEM ASSEMBLY DESCRIPTION | $ MAT (000) | $ LAB (000) | $ EQ (000) | $ TOTAL (000) | % TOT | $/FAC QTY | TOT MH | TOT EH |
|---|---|---|---|---|---|---|---|---|
| SYSTEM 06 INTERIOR FINISHES | | | | | | | | |
| SUBSYSTEM 03 CEILING & CEILING FINISHES | | | | | | | | |
| ASSEMBLY 0301/00 5/8" GYPSUM WALL BOARD CEILING, 1 LAYER, FIRE RATED | 0.3 | 0.3 | 0.0 | 0.6 | 2.4% | 0.03 | 19 | 5 |
| ASSEMBLY 0402/00 2' X 2' OR 2' X 4' FIBERGLASS ACOUSTICAL CEILING TILES | 3.3 | 1.2 | 0.0 | 4.5 | 17.7% | 0.19 | 82 | 20 |
| ASSEMBLY 0601/00 PAINTING TO DRYWALL OR PLASTER USING ROLLERS, 2 COATS | 1.3 | 1.4 | 0.0 | 2.7 | 10.6% | 0.12 | 147 | 31 |
| ASSEMBLY 0702/00 T-BAR CEILING SUSPENSION SYSTEM 2' X 2' GRID | 2.9 | 1.0 | 0.0 | 3.9 | 15.4% | 0.16 | 68 | 17 |
| ASSEMBLY 0703/00 T-BAR CEILING SUSPENSION SYSTEM 2' X 4' GRID | 0.3 | 0.1 | 0.0 | 0.4 | 1.6% | 0.01 | 6 | 1 |
| ASSEMBLY 0704/00 SUSPENSION SYSTEM FOR GYPSUM BOARD CEILING | 3.0 | 5.4 | 0.2 | 8.6 | 33.9% | 0.36 | 495 | 99 |
| ASSEMBLY 0902/00 EXTERIOR CANOPY W/FRAMING | 4.1 | 0.5 | 0.1 | 4.7 | 18.5% | 0.20 | 38 | 12 |
| SUBSYSTEM 03 TOTAL | 15.2 | 9.9 | 0.3 | 25.4 | 22.9% | 1.08 | 855 | 186 |
| PERCENT OF SUBSYSTEM TOTAL | 59.8% | 39.0% | 1.2% | | | | | |
| SYSTEM 06 TOTAL | 71.1 | 39.2 | 0.7 | 111.0 | 7.3% | 4.73 | 3,249 | 651 |
| PERCENT OF SYSTEM TOTAL | 64.1% | 35.3% | 0.6% | | | | | |
| SYSTEM 07 SPECIALTIES | | | | | | | | |
| SUBSYSTEM 01 GENERAL SPECIALTIES | | | | | | | | |
| ASSEMBLY 0206/00 GRAB BARS | 0.1 | 0.0 | 0.0 | 0.1 | 0.3% | 0.01 | 2 | 0 |
| ASSEMBLY 0212/00 TOILET ACCESSORIES FOR SINGLE TOILET | 28.1 | 2.8 | 0.1 | 31.0 | 96.3% | 1.32 | 201 | 50 |
| ASSEMBLY 0601/00 10" WIDE STOCK PREFINISHED SHELVES WITH SUPPORTS | 0.7 | 0.4 | 0.0 | 1.1 | 3.4% | 0.05 | 29 | 10 |
| SUBSYSTEM 01 TOTAL | 28.9 | 3.2 | 0.1 | 32.2 | 68.4% | 1.37 | 232 | 60 |
| PERCENT OF SUBSYSTEM TOTAL | 89.8% | 9.9% | 0.3% | | | | | |
| SYSTEM 07 SPECIALTIES | | | | | | | | |
| SUBSYSTEM 02 BUILT-IN SPECIALTIES | | | | | | | | |
| ASSEMBLY 0201/00 PLASTIC LAMINATE CABINETS WITH COUNTERTOP AND DRAWERS | 3.8 | 0.2 | 0.0 | 4.0 | 26.8% | 0.17 | 17 | 4 |
| ASSEMBLY 0210/00 METAL BASE AND WALL CABINETS | 8.3 | 1.6 | 0.0 | 9.9 | 66.4% | 0.42 | 117 | 31 |

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NURSING HOME DESIGN MODEL, COMPUTER OUTPUT-ASSEMBLY LEVEL, CONSTRUCTION COSTS

| SYSTEM/SUBSYSTEM ASSEMBLY DESCRIPTION | $ MAT (000) | $ LAB (000) | $ EQ (000) | $ TOTAL (000) | % TOT | $/FAC QTY | TOT MH | TOT EH |
|---|---|---|---|---|---|---|---|---|
| ASSEMBLY 0502/00 FIRE EXTINGUISHER CABINET, 8" X 16" X 38" | 0.7 | 0.2 | 0.0 | 0.9 | 6.0% | 0.04 | 12 | 3 |
| SUBSYSTEM 02 TOTAL | 12.8 | 2.0 | 0.1 | 14.9 | 31.6% | 0.63 | 147 | 38 |
| PERCENT OF SUBSYSTEM TOTAL | 85.9% | 13.4% | 0.7% | | | | | |
| SYSTEM 07 TOTAL | 41.7 | 5.2 | 0.2 | 47.1 | 3.1% | 2.01 | 379 | 99 |
| PERCENT OF SYSTEM TOTAL | 88.5% | 11.0% | 0.5% | | | | | |
| SYSTEM 08 PLUMBING | | | | | | | | |
| SUBSYSTEM 01 DOMESTIC WATER SUPPLY | | | | | | | | |
| ASSEMBLY 0101/00 COPPER PIPE & FITTINGS | 27.9 | 23.3 | 0.9 | 52.1 | 70.7% | 2.22 | 1,461 | 551 |
| ASSEMBLY 0201/00 VALVES & HYDRANTS | 2.7 | 0.7 | 0.0 | 3.4 | 4.6% | 0.14 | 38 | 10 |
| ASSEMBLY 0304/00 DOMESTIC WATER SUPPLY EQUIP - 100 GAL., GAS, HOT WATER | 5.1 | 0.2 | 0.0 | 5.3 | 7.2% | 0.22 | 10 | 3 |
| ASSEMBLY 0310/00 WATER SUPPLY EQUIPMENT - BOOSTER PUMP | 0.4 | 0.0 | 0.0 | 0.4 | 0.5% | 0.02 | 3 | 1 |
| ASSEMBLY 0401/00 FIBERGLASS 1-1/2" PIPE INSULATION WITH VAPOR BARRIER | 9.8 | 2.6 | 0.1 | 12.5 | 17.0% | 0.54 | 269 | 73 |
| SUBSYSTEM 01 TOTAL | 45.9 | 26.8 | 1.0 | 73.7 | 45.2% | 3.14 | 1,780 | 638 |
| PERCENT OF SUBSYSTEM TOTAL | 62.3% | 36.4% | 1.3% | | | | | |
| SYSTEM 08 PLUMBING | | | | | | | | |
| SUBSYSTEM 02 SANITARY WASTE & VENT SYSTEM | | | | | | | | |
| ASSEMBLY 0101/00 WASTE PIPE & FITTINGS ORDINARY FAC. | 14.7 | 10.4 | 0.3 | 25.4 | 78.6% | 1.08 | 728 | 195 |
| ASSEMBLY 0201/00 C.I. NO HUB VENT PIPE SYSTM | 3.0 | 2.8 | 0.1 | 5.9 | 18.3% | 0.25 | 199 | 53 |
| ASSEMBLY 0301/00 FLOOR DRAINS | 0.5 | 0.5 | 0.0 | 1.0 | 3.1% | 0.05 | 39 | 10 |
| SUBSYSTEM 02 TOTAL | 18.2 | 13.7 | 0.4 | 32.3 | 19.8% | 1.38 | 966 | 259 |
| PERCENT OF SUBSYSTEM TOTAL | 56.3% | 42.4% | 1.3% | | | | | |
| SYSTEM 08 PLUMBING | | | | | | | | |
| SUBSYSTEM 04 PLUMBING FIXTURES | | | | | | | | |
| ASSEMBLY 0101/00 FLOOR MOUNTED - WATER CLOSET | 0.3 | 0.1 | 0.0 | 0.4 | 0.7% | 0.02 | 8 | 2 |

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NURSING HOME DESIGN MODEL, COMPUTER OUTPUT-ASSEMBLY LEVEL, CONSTRUCTION COSTS

| SYSTEM/SUBSYSTEM ASSEMBLY DESCRIPTION | $ MAT (000) | $ LAB (000) | $ EQ (000) | $ TOTAL (000) | % TOT | $/FAC QTY | TOT MH | TOT EH |
|---|---|---|---|---|---|---|---|---|
| ASSEMBLY 0102/00 FLOOR MOUNTED - WATER CLOSET - HANDICAP - TANKTYPE | 1.3 | 0.4 | 0.0 | 1.7 | 3.0% | 0.07 | 31 | 8 |
| ASSEMBLY 0103/00 ELONGATED, FLOOR MOUNTED WATER CLOSET | 0.2 | 0.1 | 0.0 | 0.3 | 0.5% | 0.01 | 4 | 1 |
| ASSEMBLY 0104/00 WALL MOUNTED - WATER CLOSET | 16.0 | 3.2 | 0.1 | 19.3 | 33.9% | 0.82 | 228 | 61 |
| ASSEMBLY 0303/00 WALL HUNG 20" BY 18" WHITE SINGLE BOWL LAVATORY | 12.6 | 3.9 | 0.1 | 16.6 | 29.1% | 0.71 | 284 | 76 |
| ASSEMBLY 0307/00 WALL HUNG - HANDICAPPED | 4.0 | 0.2 | 0.0 | 4.2 | 7.4% | 0.18 | 13 | 4 |
| ASSEMBLY 0406/00 SERVICE SINK - ENAMELED CAST IRON | 1.9 | 0.1 | 0.0 | 2.0 | 3.5% | 0.09 | 10 | 3 |
| ASSEMBLY 0407/00 JANITOR SINK - FLOOR TYPE | 1.3 | 0.1 | 0.0 | 1.4 | 2.5% | 0.06 | 9 | 2 |
| ASSEMBLY 0408/00 WALL HUNG 24" BY 20" JANITORS SINK OF PORCELAIN ENAMEL | 0.9 | 0.1 | 0.0 | 1.0 | 1.8% | 0.04 | 8 | 2 |
| ASSEMBLY 0409/00 CORNER STYLE FLOOR MOUNTED 28" BY 28" JANITORS SINK | 0.9 | 0.2 | 0.0 | 1.1 | 1.9% | 0.05 | 14 | 4 |
| ASSEMBLY 0502/00 SHOWER VALVE, DRAIN FOR CERAMIC TILE SHOWER | 3.6 | 3.9 | 0.1 | 7.6 | 13.3% | 0.32 | 284 | 76 |
| ASSEMBLY 0602/00 14 GPH ELECTRIC WATER COOLER - WALL MOUNTED | 1.0 | 0.1 | 0.0 | 1.1 | 1.9% | 0.05 | 9 | 2 |
| SUBSYSTEM 04 TOTAL | 44.1 | 12.5 | 0.4 | 57.0 | 35.0% | 2.43 | 901 | 242 |
| PERCENT OF SUBSYSTEM TOTAL | 77.4% | 21.9% | 0.7% | | | | | |
| SYSTEM 08 TOTAL | 108.2 | 53.0 | 1.7 | 162.9 | 10.7% | 6.94 | 3,647 | 1,139 |
| PERCENT OF SYSTEM TOTAL | 66.4% | 32.5% | 1.1% | | | | | |
| SYSTEM 09 H.V.A.C | | | | | | | | |
| SUBSYSTEM 01 ENERGY SUPPLY | | | | | | | | |
| ASSEMBLY 0205/00 425 MBH GAS SUPPLY | 0.8 | 0.4 | 0.0 | 1.2 | 100.0% | 0.05 | 26 | 7 |
| SUBSYSTEM 01 TOTAL | 0.8 | 0.4 | 0.0 | 1.2 | 0.8% | 0.05 | 26 | 7 |
| PERCENT OF SUBSYSTEM TOTAL | 66.7% | 33.3% | 0.0% | | | | | |
| SYSTEM 09 H.V.A.C | | | | | | | | |
| SUBSYSTEM 04 DISTRIBUTION SYSTEMS | | | | | | | | |
| ASSEMBLY 0168/00 1.2 MCFM AIR DISTRIBUTION SYSTEM FOR ROOF TOP UNIT | 8.8 | 5.2 | 0.1 | 14.1 | 36.1% | 0.60 | 352 | 99 |
| ASSEMBLY 0169/00 2.0 MCFM AIR DISTRIBUTION SYSTEM FOR ROOF TOP UNIT | 15.5 | 9.2 | 0.3 | 25.0 | 63.9% | 1.06 | 611 | 172 |

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NURSING HOME DESIGN MODEL, COMPUTER OUTPUT-ASSEMBLY LEVEL, CONSTRUCTION COSTS

| SYSTEM/SUBSYSTEM ASSEMBLY DESCRIPTION | $ MAT (000) | $ LAB (000) | $ EQ (000) | $ TOTAL (000) | % TOT | $/FAC QTY | TOT MH | TOT EH |
|---|---|---|---|---|---|---|---|---|
| SUBSYSTEM 04 TOTAL | 24.3 | 14.4 | 0.4 | 39.1 | 24.7% | 1.67 | 962 | 271 |
| PERCENT OF SUBSYSTEM TOTAL | 62.1% | 36.8% | 1.1% | | | | | |
| SYSTEM 09 H.V.A.C | | | | | | | | |
| SUBSYSTEM 05 TERMINAL & PACKAGE UNITS | | | | | | | | |
| ASSEMBLY 0201/00 THRU THE WALL HEAT PUMP, .68 MBH | 30.3 | 1.7 | 0.0 | 32.0 | 46.6% | 1.37 | 113 | 31 |
| ASSEMBLY 0202/00 THRU THE WALL HEAT PUMP, .85 MBH | 0.9 | 0.1 | 0.0 | 1.0 | 1.5% | 0.04 | 3 | 1 |
| ASSEMBLY 0207/00 ROOF TOP UNIT 3 TON | 10.7 | 1.0 | 0.2 | 11.9 | 17.3% | 0.51 | 73 | 28 |
| ASSEMBLY 0208/00 ROOF TOP UNIT 5 TON | 21.9 | 1.5 | 0.3 | 23.7 | 34.5% | 1.01 | 110 | 41 |
| SUBSYSTEM 05 TOTAL | 63.9 | 4.2 | 0.5 | 68.6 | 43.3% | 2.93 | 300 | 101 |
| PERCENT OF SUBSYSTEM TOTAL | 93.1% | 6.1% | 0.8% | | | | | |
| SYSTEM 09 H.V.A.C | | | | | | | | |
| SUBSYSTEM 06 CONTROLS & INSTRUMENTATION | | | | | | | | |
| ASSEMBLY 0116/00 CONTROLS FOR 2 TON AIR CONDITIONING SYSTEM | 0.2 | 0.3 | 0.0 | 0.5 | 100.0% | 0.02 | 13 | 0 |
| SUBSYSTEM 06 TOTAL | 0.2 | 0.3 | 0.0 | 0.5 | 0.3% | 0.02 | 13 | 0 |
| PERCENT OF SUBSYSTEM TOTAL | 40.0% | 60.0% | 0.0% | | | | | |
| SYSTEM 09 H.V.A.C | | | | | | | | |
| SUBSYSTEM 07 SYSTEMS TESTING & BALANCING | | | | | | | | |
| ASSEMBLY 0201/00 TEST & BALANCE, CENT FAN/UTILITY SET | 0.0 | 2.7 | 0.1 | 2.8 | 14.7% | 0.12 | 165 | 45 |
| ASSEMBLY 0208/00 TEST & BALANCE PACKAGE AC UNIT | 0.0 | 11.5 | 0.3 | 11.8 | 61.8% | 0.50 | 686 | 198 |
| ASSEMBLY 0211/00 TEST & BALANCE VAV BOX | 0.5 | 0.3 | 0.0 | 0.8 | 4.2% | 0.03 | 18 | 5 |
| ASSEMBLY 0212/00 TEST & BALANCE REGISTER AVERAGE CEILING HEIGHT | 0.0 | 3.6 | 0.1 | 3.7 | 19.4% | 0.16 | 222 | 60 |
| SUBSYSTEM 07 TOTAL | 0.5 | 18.1 | 0.5 | 19.1 | 12.1% | 0.81 | 1,091 | 308 |
| PERCENT OF SUBSYSTEM TOTAL | 2.6% | 94.8% | 2.6% | | | | | |
| SYSTEM 09 H.V.A.C | | | | | | | | |
| SUBSYSTEM 08 VENTILATING/EXHAUST SYSTEMS | | | | | | | | |

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NURSING HOME DESIGN MODEL, COMPUTER OUTPUT-ASSEMBLY LEVEL, CONSTRUCTION COSTS

| SYSTEM/SUBSYSTEM ASSEMBLY DESCRIPTION | $ MAT (000) | $ LAB (000) | $ EQ (000) | $ TOTAL (000) | % TOT | $/FAC QTY | TOT MH | TOT EH |
|---|---|---|---|---|---|---|---|---|
| ASSEMBLY 0106/00 .60 CFM TOILET EXHAUST SYSTEM | 22.8 | 3.8 | 0.1 | 26.7 | 89.3% | 1.14 | 274 | 79 |
| ASSEMBLY 0107/00 BATHROOM EXHAUST SYSTEM 1000 CFM | 2.7 | 0.5 | 0.0 | 3.2 | 10.7% | 0.14 | 41 | 12 |
| SUBSYSTEM 08 TOTAL | 25.5 | 4.3 | 0.1 | 29.9 | 18.9% | 1.28 | 314 | 91 |
| PERCENT OF SUBSYSTEM TOTAL | 85.3% | 14.4% | 0.3% | | | | | |
| SYSTEM 09 TOTAL | 115.2 | 41.7 | 1.5 | 158.4 | 10.4% | 6.75 | 2,707 | 778 |
| PERCENT OF SYSTEM TOTAL | 72.7% | 26.3% | 1.0% | | | | | |
| SYSTEM 10 SPECIAL MECHANICAL SYSTEMS | | | | | | | | |
| SUBSYSTEM 01 FIRE PROTECTION | | | | | | | | |
| ASSEMBLY 0105/00 FIRE PROTECTION WATER SUPPLY | 6.9 | 0.5 | 0.0 | 7.4 | 23.3% | 0.32 | 34 | 10 |
| ASSEMBLY 0202/00 CONCEALED SPRINKLER HEADS, PIPES & FITTINGS -ORD. HAZ. | 24.4 | 0.0 | 0.0 | 24.4 | 77.0% | 1.04 | 0 | 0 |
| SUBSYSTEM 01 TOTAL | 31.2 | 0.5 | 0.0 | 31.7 | 100.0% | 1.35 | 34 | 10 |
| PERCENT OF SUBSYSTEM TOTAL | 98.4% | 1.6% | 0.0% | | | | | |
| SYSTEM 10 TOTAL | 31.2 | 0.5 | 0.0 | 31.7 | 2.1% | 1.35 | 34 | 10 |
| PERCENT OF SYSTEM TOTAL | 98.4% | 1.6% | 0.0% | | | | | |
| SYSTEM 11 ELECTRICAL | | | | | | | | |
| SUBSYSTEM 01 SERVICE AND DISTRIBUTION | | | | | | | | |
| ASSEMBLY 0307/00 UNGRD 800 AMP MAIN SWITCHBOARD | 42.1 | 2.9 | 0.0 | 45.0 | 60.9% | 1.92 | 146 | 13 |
| ASSEMBLY 0502/00 PANELBD 208V 100A 30 CIR MLO W/BKR | 3.7 | 4.0 | 0.0 | 7.7 | 10.4% | 0.33 | 210 | 20 |
| ASSEMBLY 0507/00 PANELBD 208V 225A 42 CIR MLO W/BKR | 11.4 | 9.6 | 0.1 | 21.1 | 28.6% | 0.90 | 501 | 48 |
| SUBSYSTEM 01 TOTAL | 57.2 | 16.6 | 0.1 | 73.9 | 43.4% | 3.15 | 857 | 81 |
| PERCENT OF SUBSYSTEM TOTAL | 77.4% | 22.5% | 0.1% | | | | | |
| SYSTEM 11 ELECTRICAL | | | | | | | | |
| SUBSYSTEM 02 LIGHTING & POWER | | | | | | | | |
| ASSEMBLY 0101/00 120 VOLT, 20 AMP DUPLEX RECEPTACLE - STUD PARTITION | 0.9 | 2.5 | 0.0 | 3.4 | 3.5% | 0.15 | 131 | 12 |
| ASSEMBLY 0102/00 120 VOLT, 20 AMP DUPLEX RECEPTACLE - MASONRY PARTITION | 4.7 | 12.4 | 0.1 | 17.2 | 17.9% | 0.73 | 652 | 61 |

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NURSING HOME DESIGN MODEL, COMPUTER OUTPUT-ASSEMBLY LEVEL, CONSTRUCTION COSTS

| SYSTEM/SUBSYSTEM ASSEMBLY DESCRIPTION | $ MAT (000) | $ LAB (000) | $ EQ (000) | $ TOTAL (000) | % TOT | $/FAC QTY | TOT MH | TOT EH |
|---|---|---|---|---|---|---|---|---|
| ASSEMBLY 0103/00 DUPLEX RECEPTACLE LONG RUN | 0.4 | 1.1 | 0.0 | 1.5 | 1.6% | 0.06 | 60 | 6 |
| ASSEMBLY 0106/00 120 VOLT, 15 AMP DUPLEX GROUND FAULT RECEPTACLE | 0.3 | 0.7 | 0.0 | 1.0 | 1.0% | 0.05 | 39 | 3 |
| ASSEMBLY 0107/00 120 VOLT, 15 AMP DUPLEX GROUND FAULT RECEPTACLE | 2.1 | 4.4 | 0.0 | 6.5 | 6.8% | 0.28 | 230 | 20 |
| ASSEMBLY 0122/00 230 VOLT, 30 AMP RECEPTACLE - MASONRY PARTITION | 4.5 | 7.1 | 0.1 | 11.7 | 12.2% | 0.50 | 379 | 36 |
| ASSEMBLY 0136/00 EQUIPMENT CONNECTIONS FOR UP TO 5 HP | 0.2 | 0.4 | 0.0 | 0.6 | 0.6% | 0.02 | 19 | 2 |
| ASSEMBLY 0156/00 120V 20A SINGLE POLE SWITCH | 1.0 | 2.6 | 0.0 | 3.6 | 3.7% | 0.15 | 136 | 12 |
| ASSEMBLY 0201/00 FOUR FOOT STRIP FLOURESCENT FIXTURE | 1.7 | 4.1 | 0.0 | 5.8 | 6.0% | 0.25 | 218 | 21 |
| ASSEMBLY 0202/00 2' X 4' LAY-IN FLUORESCENT FIXTURE | 4.5 | 9.9 | 0.1 | 14.5 | 15.1% | 0.62 | 534 | 51 |
| ASSEMBLY 0203/00 2' X 4' TWO-TUBE TROFFER | 0.3 | 0.6 | 0.J | 0.9 | 0.9% | 0.04 | 31 | 3 |
| ASSEMBLY 0204/00 277 VOLT 2' X 4' FLUORESCENT FIXTURE | 2.0 | 1.4 | 0.0 | 3.4 | 3.5% | 0.15 | 77 | 7 |
| ASSEMBLY 0205/00 FLORESCENT TROFFER W/ PARABOLIC BAFFLE | 5.6 | 2.2 | 0.0 | 7.8 | 8.1% | 0.33 | 118 | 10 |
| ASSEMBLY 0207/00 2' X 4' LAY-IN FLUORESCENT FIXTURE WITH EMERGENCY UNIT | 1.3 | 1.0 | 0.0 | 2.3 | 2.4% | 0.10 | 55 | 5 |
| ASSEMBLY 0209/00 SURFACE MOUNT 2' X 4' FLUORESCENT FIXTURE | 0.4 | 0.3 | 0.0 | 0.7 | 0.7% | 0.03 | 16 | 1 |
| ASSEMBLY 0214/00 SURFACE MOUNTED 1' X 4' FLUORESCENT FIXTURE | 0.1 | 0.1 | 0.0 | 0.2 | 0.2% | 0.01 | 7 | 1 |
| ASSEMBLY 0220/00 CEILING RECESSED INCANDESCENT 100 WATT FIXTURE | 0.1 | 0.2 | 0.0 | 0.3 | 0.3% | 0.01 | 8 | 1 |
| ASSEMBLY 0221/00 RECESSED INCANDESCENT SQUARE FIXTURE | 0.5 | 1.2 | 0.0 | 1.7 | 1.8% | 0.07 | 64 | 6 |
| ASSEMBLY 0227/00 175W MERCURY VAPOR WALL PACK | 1.6 | 1.3 | 0.0 | 2.9 | 3.0% | 0.13 | 68 | 6 |
| ASSEMBLY 0235/00 150 WATT HPS RECESSED FIXTURE | 0.7 | 0.5 | 0.0 | 1.2 | 1.2% | 0.05 | 27 | 2 |
| ASSEMBLY 0239/00 400W HPS FLOOD LIGHT | 0.6 | 0.5 | 0.0 | 1.1 | 1.1% | 0.05 | 24 | 2 |
| ASSEMBLY 0272/00 EXIT LIGHT WITH BATTERY BACKUP | 1.5 | 1.9 | 0.0 | 3.4 | 3.5% | 0.14 | 96 | 8 |
| ASSEMBLY 0276/00 PORCELAIN LAMP HOLDER | 0.9 | 3.2 | 0.0 | 4.1 | 4.3% | 0.18 | 171 | 16 |
| ASSEMBLY 0278/00 ACCENT WALL FIXTURE, 100W | 0.1 | 0.3 | 0.0 | 0.4 | 0.4% | 0.02 | 17 | 2 |

[> CONTINUED NEXT PAGE <]

NURSING HOME DESIGN MODEL, COMPUTER OUTPUT-ASSEMBLY LEVEL, CONSTRUCTION COSTS

| SYSTEM/SUBSYSTEM ASSEMBLY DESCRIPTION | $ MAT (000) | $ LAB (000) | $ EQ (000) | $ TOTAL (000) | % TOT | $/FAC QTY | TOT MH | TOT EH |
|---|---|---|---|---|---|---|---|---|
| SUBSYSTEM 02 TOTAL | 36.0 | 59.8 | 0.4 | 96.2 | 56.5% | 4.10 | 3,176 | 295 |
| PERCENT OF SUBSYSTEM TOTAL | 37.4% | 62.2% | 0.4% | | | | | |
| SYSTEM 11 TOTAL | 93.2 | 76.4 | 0.6 | 170.2 | 11.2% | 7.25 | 4,033 | 376 |
| PERCENT OF SYSTEM TOTAL | 54.8% | 44.9% | 0.3% | | | | | |
| SYSTEM 12 SPECIAL ELECTRICAL SYSTEMS | | | | | | | | |
| SUBSYSTEM 01 COMMUNICATION & ALARM SYSTEMS | | | | | | | | |
| ASSEMBLY 0102/00 FIRE ALARM SYSTEM - RATE OF RISE HEAT DETECTORS | 3.9 | 7.4 | 0.1 | 11.4 | 45.6% | 0.48 | 397 | 37 |
| ASSEMBLY 0104/00 FIRE ALARM DUCT SMOKE DETECTOR | 0.3 | 0.2 | 0.0 | 0.5 | 2.0% | 0.02 | 13 | 1 |
| ASSEMBLY 0118/00 12-ZONE FACP WITH ANNUM AND TRANSMITTER | 11.7 | 1.4 | 0.0 | 13.1 | 52.4% | 0.56 | 70 | 6 |
| SUBSYSTEM 01 TOTAL | 15.8 | 9.1 | 0.1 | 25.0 | 100.0% | 1.07 | 480 | 45 |
| PERCENT OF SUBSYSTEM TOTAL | 63.2% | 36.4% | 0.4% | | | | | |
| SYSTEM 12 TOTAL | 15.8 | 9.1 | 0.1 | 25.0 | 1.6% | 1.07 | 480 | 45 |
| PERCENT OF SYSTEM TOTAL | 63.2% | 36.4% | 0.4% | | | | | |
| SYSTEM 99 CONTRACTOR OVERHEAD AND PROFIT | | | | | | | | |
| SUBSYSTEM 00 GENERAL CONDITIONS & PROFIT | | | | | | | | |
| ASSEMBLY 0000 COMPARATIVE GENERAL CONDITIONS & PROFIT | 113.4 | 51.7 | 1.9 | 167.0 | 100.0% | 7.12 | 0 | 0 |
| SUBSYSTEM 00 TOTAL | 113.4 | 51.7 | 1.9 | 167.0 | 100.0% | 7.12 | 0 | 0 |
| PERCENT OF SUBSYSTEM TOTAL | 67.9% | 31.0% | 1.1% | | | | | |
| SYSTEM 99 TOTAL | 113.4 | 51.7 | 1.9 | 167.0 | 11.0% | 7.12 | 0 | 0 |
| PERCENT OF SYSTEM TOTAL | 67.9% | 31.0% | 1.1% | | | | | |
| FACILITY TOTAL | 1,035.2 | 471.7 | 17.7 | 1,524.6 | 100.0% | 64.99 | 31,243 | 6,575 |
| PERCENT OF FACILITY TOTAL | 67.9% | 30.9% | 1.2% | | | | | |

# APPENDIX E

# APPLICATION AND CERTIFICATE FOR PAYMENT

# APPLICATION AND CERTIFICATE FOR PAYMENT

*AIA DOCUMENT G702*

PAGE ONE PAGES

TO (Owner): Brookwood Investments, Ltd
Pharr Center
550 Pharr Rodd, N.E. Suite 210
Atlanta, GA 30305

ATTENTION: Allen McGinnis

PROJECT: Walton County Convalescent Center
Defuniak Springs, Florida

CONTRACT FOR: Renovations & Addition to Walton County Convalescent Center

APPLICATION NO:

PERIOD FROM:
TO:

ARCHITECT'S PROJECT NO:

CONTRACT DATE:

Distribution to:
☐ OWNER
☐ ARCHITECT
☐ CONTRACTOR
☐
☐

## CONTRACTOR'S APPLICATION FOR PAYMENT

| CHANGE ORDER SUMMARY | | |
|---|---|---|
| Change Orders approved in previous months by Owner TOTAL | ADDITIONS | DEDUCTIONS |
| Approved this Month: Number / Date Approved | | |
| TOTALS | | |
| Net change by Change Orders | | |

The undersigned Contractor certifies that to the best of his knowledge, information and belief the Work covered by this Application for Payment has been completed in accordance with the Contract Documents, that all amounts have been paid by him for Work for which previous Certificates for Payment were issued and payments received from the Owner, and that current payment shown herein is now due.

CONTRACTOR:

By: ________________ Date: ________

Application is made for Payment, as shown below, in connection with the Contract. Continuation Sheet, AIA Document G703, is attached.

The present status of the account for this Contract is as follows:

ORIGINAL CONTRACT SUM .................... $1,680,453.00

Net change by Change Orders .................... $

CONTRACT SUM TO DATE .................... $

TOTAL COMPLETED & STORED TO DATE .................... $
(Column G on G703)

RETAINAGE ______% .................... $
or total in Column I on G703

TOTAL EARNED LESS RETAINAGE .................... $

LESS PREVIOUS CERTIFICATES FOR PAYMENT .................... $

CURRENT PAYMENT DUE .................... $

State of: County of:
Subscribed and sworn to before me this day of , 19
Notary Public:
My Commission expires:

## ARCHITECT'S CERTIFICATE FOR PAYMENT

In accordance with the Contract Documents, based on on-site observations and the data comprising the above application, the Architect certifies to the Owner that the Work has progressed to the point indicated; that to the best of his knowledge, information and belief, the quality of the Work is in accordance with the Contract Documents; and that the Contractor is entitled to payment of the AMOUNT CERTIFIED.

AMOUNT CERTIFIED .................... $

*(Attach explanation if amount certified differs from the amount applied for.)*

ARCHITECT:

By: ________________ Date: ________

This Certificate is not negotiable. The AMOUNT CERTIFIED is payable only to the Contractor named herein. Issuance, payment and acceptance of payment are without prejudice to any rights of the Owner or Contractor under this Contract.

CONTINUATION SHEET — AIA DOCUMENT G703 — PAGE OF PAGES

AIA Document G702, APPLICATION AND CERTIFICATE FOR PAYMENT, containing Contractor's signed Certification is attached.
In tabulations below, amounts are stated to the nearest dollar.
Use Column I on Contracts where variable retainage for line items may apply.

APPLICATION NUMBER:
APPLICATION DATE:
PERIOD FROM:
TO:
ARCHITECT'S PROJECT NO:

| A | B | C | D | E | F | G | | H | I |
|---|---|---|---|---|---|---|---|---|---|
| ITEM No. | DESCRIPTION OF WORK | SCHEDULED VALUE | WORK COMPLETED | | | TOTAL COMPLETED AND STORED TO DATE (D+E+F) | % (G÷C) | BALANCE TO FINISH (C−G) | RETAINAGE |
| | | | Previous Applications | This Application: Work in Place | This Application: Stored Materials (not in D or E) | | | | |
| 1 | General Requirements | | | | | | | | |
| | Demolition | 5,556.00 | | | | | | | |
| | Dust Protection | 1,070.00 | | | | | | | |
| | Dump Fees | 535.00 | | | | | | | |
| | Receive/Store Owner's Equipment | 1,835.00 | | | | | | | |
| | Environmental Protection | 2,370.00 | | | | | | | |
| 2 | Site Work | | | | | | | | |
| | Clear and Grub | 2,000.00 | | | | | | | |
| | Cut & Fill | 103,384.00 | | | | | | | |
| | Detention Pond | 2,000.00 | | | | | | | |
| | Erosion Control | 3,293.00 | | | | | | | |
| | Storm Sewer | 31,050.00 | | | | | | | |
| | Outside Utilities | 23,456.00 | | | | | | | |
| | Excavation-Footings | 9,252.00 | | | | | | | |
| | Soil Testing | 2,000.00 | | | | | | | |
| | Termite Pretreat | 3,118.00 | | | | | | | |
| | Asphalt Paving | 38,500.00 | | | | | | | |
| | Landscaping | 15,000.00 | | | | | | | |
| 3 | Concrete Work | | | | | | | | |
| | Transit Mix Concrete | 55,694.00 | | | | | | | |
| | Reinforcing | 17,582.00 | | | | | | | |
| | Formwork | 9,650.00 | | | | | | | |
| | Finishes | 11,249.00 | | | | | | | |
| | Testing | 1,200.00 | | | | | | | |

# CONTINUATION SHEET

AIA DOCUMENT G703 (Instructions on reverse side) PAGE OF PAGES

AIA Document G702, APPLICATION AND CERTIFICATE FOR PAYMENT, containing Contractor's signed Certification is attached.

In tabulations below, amounts are stated to the nearest dollar.

Use Column I on Contracts where variable retainage for line items may apply.

APPLICATION NUMBER:
APPLICATION DATE:
PERIOD TO:
ARCHITECT'S PROJECT NO:

| A | B | C | D | E | F | G | | H | I |
|---|---|---|---|---|---|---|---|---|---|
| ITEM NO. | DESCRIPTION OF WORK | SCHEDULED VALUE | WORK COMPLETED | | MATERIALS PRESENTLY STORED (NOT IN D OR E) | TOTAL COMPLETED AND STORED TO DATE (D + E + F) | % (G ÷ C) | BALANCE TO FINISH (C − G) | RETAINAGE |
| | | | FROM PREVIOUS APPLICATION (D + E) | THIS PERIOD | | | | | |
| 4 | Hollow Core Precast Slabs | 101,586.00 | | | | | | | |
| 5 | Masonry | | | | | | | | |
| | Concrete Masonry Units | 98,188.00 | | | | | | | |
| | Mortar | 5,447.00 | | | | | | | |
| | Masonry Reinforcing | 1,801.00 | | | | | | | |
| | Masonry Insulation | 4,778.00 | | | | | | | |
| | Precast window Stools | 9,418.00 | | | | | | | |
| 6 | Metals | | | | | | | | |
| | Structural/Misc. Steel | 18,918.00 | | | | | | | |
| | Handrail Brackets | 2,885.00 | | | | | | | |
| 7 | Carpentry | | | | | | | | |
| | Rough Carpentry | 93,667.00 | | | | | | | |
| | Finish Carpentry | 22,712.00 | | | | | | | |
| 8 | Thermal & Moisture Protection | | | | | | | | |
| | Vapor Barrier/Damp Proofing | 4,626.00 | | | | | | | |
| | Insulation | 1,120.00 | | | | | | | |
| | Caulking | 1,500.00 | | | | | | | |
| | Roofing & Sheet Metal | 42,931.00 | | | | | | | |
| 9 | Doors & Windows | | | | | | | | |
| | Metal Doors & Frames | 19,028.00 | | | | | | | |
| | Wood Doors | 21,374.00 | | | | | | | |
| | | | | | | | | | |

# CONTINUATION SHEET

**AIA DOCUMENT G703** (Instructions on reverse side) PAGE OF PAGES

AIA Document G702, APPLICATION AND CERTIFICATE FOR PAYMENT, containing Contractor's signed Certification is attached.

In tabulations below, amounts are stated to the nearest dollar.

Use Column I on Contracts where variable retainage for line items may apply.

APPLICATION NUMBER:
APPLICATION DATE:
PERIOD TO:
ARCHITECT'S PROJECT NO:

| A | B | C | D | E | F | G | | H | I |
|---|---|---|---|---|---|---|---|---|---|
| ITEM NO. | DESCRIPTION OF WORK | SCHEDULED VALUE | WORK COMPLETED: FROM PREVIOUS APPLICATION (D + E) | WORK COMPLETED: THIS PERIOD | MATERIALS PRESENTLY STORED (NOT IN D OR E) | TOTAL COMPLETED AND STORED TO DATE (D + E + F) | % (G ÷ C) | BALANCE TO FINISH (C − G) | RETAINAGE |
| | Aluminum Windows | 19,399.00 | | | | | | | |
| | Glass & Glazing | 2,000.00 | | | | | | | |
| | Finish Hardware | 19,802.00 | | | | | | | |
| 10 | Miscellaneous Specialties | | | | | | | | |
| | Identification Signs | 2,209.00 | | | | | | | |
| | Fire Extinguishers | 675.00 | | | | | | | |
| | Toilet/Bath Accessories | 15,986.00 | | | | | | | |
| | Hospital Cubicles | 9,823.00 | | | | | | | |
| 11 | Finishes | | | | | | | | |
| | Gypsum Wall Board | 37,887.00 | | | | | | | |
| | Ceramic Tile | 29,908.00 | | | | | | | |
| | Acoustical Ceiling | 7,776.00 | | | | | | | |
| | Resilient Flooring | 22,450.00 | | | | | | | |
| | Painting & Wall Covering | 43,756.00 | | | | | | | |
| | Plumbing | 144,638.00 | | | | | | | |
| | Automatic Sprinklers | 27,811.00 | | | | | | | |
| | HVAC | 123,500.00 | | | | | | | |
| | Electrical | 179,903.00 | | | | | | | |
| 12 | Field Overhead Costs | | | | | | | | |
| | Supervision | 29,016.00 | | | | | | | |
| | Clean-up | 5,017.00 | | | | | | | |
| | Other | 16,763.00 | | | | | | | |
| | Insurance | 2,400.00 | | | | | | | |
| | Building Permit | 2,000.00 | | | | | | | |
| 13 | Construction Fee | 148,453.00 | | | | | | | |
| | Total | 1,680,945.00 | | | | | | | |

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## BIOGRAPHICAL SKETCH

Rita A. Gregory is Director of Construction Cost Management, Headquarters U.S. Air Force Civil Engineering Support Agency, Tyndall Air Force Base, Florida. In this position, she is responsible for costing the multibillion dollar worldwide Air Force construction program.

She earned a Bachelor of Science degree in mathematics from North Georgia College. She continued her formal education with postgraduate work in engineering from the University of Florida at the Eglin Air Force Base campus. She completed a Master's degree in Public Administration at Golden Gate University while stationed at Headquarters Tactical Air Command, Langley Air Force Base, Virginia. She was the Air Force delegate to the 1986 Construction Executive Program at Stanford University and 1988 Fellow in the Harvard University Program for Senior Executive Fellows. She is currently a Doctoral candidate in the University of Florida, Department of Civil Engineering.

She began her professional practice at Eglin Air Force Base, Florida. While assigned to the Air Force Armament Laboratory, Weapons Systems Analysis Division, she provided engineering analyses for Air Force weapons and aircraft and designed autopilot and control systems in the Guided

Weapons Division. In the Armament Division, Directorate for Development Plans, she initiated, engineered, and directed exploratory development for advanced systems concepts. At Headquarters Tactical Air Command, Directorate of Operations Analysis, she was a leading member of the Tactical Air Force Modernization and Readiness Team which managed the acquisition and beddown of major weapon systems, and she directed the airfield attack mission area analysis. At the Naval Coastal Systems Center, she performed in the Analysis and Intelligence Office and as Director of Special Warfare Systems Development in the Systems Engineering Department.

In 1991, Mrs Gregory was chosen for the Department of Defense Distinguished Civilian Service Award, the highest honor given to a civilian employee in the Department of Defense. She is the recipient of the 1987 National Society of Professional Engineers Engineer of the Year award for the Air Force and was named to the list of "Top Ten Federal Engineers" worldwide.

She is a registered Professional Engineer in the state of Florida and a nationally Certified Cost Analyst.

Rita is married to G.B. "Greg" Gregory, a retired Naval aviator. They have a son and two daughters.

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I certify that I have read this study and that in my opinion it conforms to acceptable standards of scholarly presentation and is fully adequate, in scope and quality, as a dissertation for the degree of Doctor of Philosophy.

Rodney E. Cox

Rodney E. Cox
Professor of
Building Construction

This dissertation was submitted to the Graduate Faculty of the College of Engineering and to the Graduate School and was accepted as partial fulfillment of the requirements for the degree of Doctor of Philosophy.

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# EPILOGUE

## Introduction

This epilogue is provided to describe the Air Force interest in the research, Development of a Knowledge-Based System Approach for Decision Making in Construction Projects, cited in this technical report. This academic work was supported and funded by the Air Force. Full rights to this research were assigned by the author to the government through the Patents Division, Office of the Judge Advocate General, Department of the Air Force, (AFLSA/JACP) Wright-Patterson AFB, Ohio, in accordance with AF Regulation 110-8, "Inventions, Patents, Copyrights, and Trademarks."

## Pertinent History

In 1981, cost overruns in the construction of facilities to support the space program and unprecedented cost overruns in the Aeropropulsion System Test Integration Facility directed intense Air Force attention to facility cost estimating procedures. Special interest was placed on the need to estimate and analyze variables in the multiyear costs of facilities required to support major weapon systems acquisitions.

The Air Force answered this need by establishing the Construction Cost Management Group, of which the author was a member and director. The Group began its mission by

conducting an industry search of existing tools and methods used for major construction projects. Their mission included estimating one-of-a-kind, never-built-before facilities whose design and construction might not begin for decades. They found that neither traditional parametric cost estimating processes, that required historical data to establish cost estimating relationships, nor traditional quantity-take-off methods that required nearly complete design drawings were applicable to their mission. The group initiated research and development projects to develop improved comparative estimating processes and a new process using engineering parameters translated through modeling into detailed material, labor, and equipment work items to estimate facility costs.

The group used multiple contractors to support the automation and data development, but the model design and integration was kept "in-house." By 1985, they had developed and validated models for an administrative type facility, a medical facility, and runway/taxiway projects. In that year, the group was upgraded to the Construction Cost Management Directorate and began work on an improved comparative estimating system called the "Automated Air

Force Pricing Guide." The collection of tools and methods, developed to that time, was named the "Construction Cost Management Analysis System."

SUBJECT RESEARCH

Research and course work for this dissertation was begun by the author (currently the Director of the Construction Cost Management Directorate) in the Fall of 1987 on the combined campuses of the University of Florida at Gainesville and Eglin AFB, Florida. The author was granted temporary duty to attend the Gainesville campus in residence in August 1990. The first proposal for this dissertation on developing a knowledge-based system for construction cost management was provided to Professor Herbsman, of the Civil Engineering Department, in December 1990. When the author returned to the Air Force, she took immediate actions to incorporate the research in knowledge-based expert systems into the Construction Cost Management Analysis System. She introduced the concepts of knowledge-based expert systems, as discussed in this study, that provide unlimited combinations to forecast the costs of facilities that had never been previously constructed. The author, through this research and resulting dissertation, was solely responsible for the introduction of knowledge-based expert systems into the Construction Cost Management Analysis System.

In August 1988, under the guidance of the author, the team members of the directorate applied for a patent on the Construction Cost Management Analysis System. The patent application was titled the "Totally Integrated Construction Cost Estimating, Analysis, and Reporting System," (AF Inv 18806, Burns et al.). The original application was rejected in April 1991 by the examiner who questioned "nonstatutory subject matter" (i.e., the examiner asserted that the system was a mathematical algorithm which is not patentable data). In May 1991, the author used preliminary results of this dissertation, to provide an amendment to the original patent application. Using this research was key to the successful patent review as indicated by the following quotes from the Chief, Air Force Patent Prosecution Office, Office of the Judge Advocate General, 10 May 1991.

> . . . the amendment we proposed, which now more clearly defines the expert knowledge system, would necessitate that the application be transferred to a different examiner who specializes in expert systems. . . . The claims as amended would probably no longer be considered "non-statutory."

The patent was issued by United States Department of Commerce, Patent and Trademark Office on 23 Feb 93 with the patent number 5,189,606.

## Civil Engineering Research Foundation

In October 1991, an independent review by the Civil Engineering Research Foundation was conducted on thirty federal laboratories. This review was to "demonstrate how technology being developed by federal laboratories can improve the U.S. civil engineering design and construction industries' competitive position via the transfer of this technology into new products, processes, techniques, and practices." The draft final report, titled "Technology Transfer of Federal Research to Private Practice", rated federal technologies against multiple criteria (66). Only one technology was rated in the highest interest group. The technology rated highest was the Air Force Construction Cost Management Analysis System, in which the author had incorporated preliminary results from this research.

## Interest and Use

The Air Force has incorporated the elements of this research and dissertation in the Construction Cost Management System and distributed it to all major commands and their designated bases. It is currently being used by the Construction Cost Management Directorate for validating the multibillion dollar worldwide Air Force Construction Program and for the designated DoD and Air Force System Acquisition Review Council for the facilities

portion of the formal Component Cost Analysis (CCA) process. It is being used by the directorate for input to the DoD Tri-Service Committee on construction costs, and construction cost analyses for Air Staff, major commands, and program office's Military Construction Program cost and economic analyses.

Using the expert system, the Construction Cost Management Directorate annually performs Component Cost Analyses (CCAs) for the Air Force Cost Analysis Improvement Group (CAIG) and the OSD CAIG on facilities valued at approximately $15 billion. These facilities are part of major weapon systems programs such as the National Airspace System, B-2, Advanced Launched System, Large Rocket Test Facility (J6), Advanced Tactical Fighter, Advanced Medium Range Air-to-Air Missile, Peacekeeper Rail Garrison, Expendable Launch Vehicle, C-17 Aircraft, Small Intercontinental Ballistic Missile, MILSTAR Terminals, and Air Force special activities. A shortfall of $250 million to the B-2 facilities program was identified using this system. Use of the system on the Advanced Launch System identified a program deficit of two billion dollars. Without this CCA, this 4.4 billion dollar project would have been under funded by $2 billion. The Large Rocket Test Facility analysis resulted in a $45 million cost avoidance without change in scope.

Special analyses to support the Air Force One Hangar Complex justified special Congressional appropriations for this one-of-a-kind facility and prevented underprogramming.

The system has been used to develop costs for alternative acquisitions strategies, such as design-build, and to estimate facilities associated with major weapon systems. The resulting estimates have been shown to be 300 percent more accurate than conventional estimating methods, as validated during a nine-month period when used to analyze over $10 billion worth of construction projects.

Payoffs directly attributed to the use of these improved cost modeling tools are reductions in lost and broken design, fewer reprogramming and cost variations, and better management information for tight control and "on course" corrections from concept through construction completion. The Military Construction Program cycle has also been impacted by eliminating the two-year gap between the requirements process and construction. Prior to the development of the knowledge-based system, a detailed estimate took approximately 320 man-hours and required detailed drawings and specifications. Using the system, an estimate can now be accomplished in eight man-hours knowing only the type of facility, square footage requirements, and location. To date, the knowledge-based

estimates have averaged within five percent of the actual completion costs. Due to the astounding accuracy of the parametric estimates, a change in Congressional committee language has allowed parametric estimates on military construction projects submitted for funding. In addition, the Tri-Service Committee on Cost Engineering has selected the knowledge-based CCMAS as the basis for a TRi-service Automated Cost Estimating System (TRACES). Thus all DoD agencies are benefitting from these endeavors.

Based on the outstanding success in the military construction applications, the Environmental Protection Agency (EPA) funded additional research for the author to prototype an application of the knowledge-based technology for environmental protection and restoration. The Air Force funded full development with a resulting product, called the Remedial Action Cost Engineering and Requirements/Environmental Estimating (RACER/ENVEST) system. RACER/ENVEST has been recognized by the three military services, the EPA, Department of Energy (DOE), and the Department of Interior (DOI) as being the best available tool for costing environmental restoration. This system affects every facet of the Air Force environmental restoration program and is the process by

which funding decisions for all restoration projects will be judged. The Air Force recognizes this technology to fulfill the need for an in-house technical capability to effectively and accurately develop and analyze cost estimates for the environmental restoration program and to manage contractual actions through site clean-up. This system provides the capability to estimate all phases of restoration from preliminary assessment through "no further response action planned," with limited site and technology information. The Air Force is breaking new ground in distributing this system to other federal agencies and marketing the system to private industry under the Technology Transfer Act of 1986. Cooperative efforts in training and use of RACER for budget estimating and pricing exercises have been established with all Air Force major commands; US Army Corps of Engineers; US Naval Facilities Engineering Command; Environmental Protection Agency; Coast Guard; Department of Energy; Air National Guard; Internal Revenue Service; and Department of Interior, to include Bureaus of Mines, Land Management, Indian Affairs, and Park Service. In addition, at this writing, RACER/ENVEST is being used by 24 government contractors, four state governments, and three nongovernmental registered users, which include private industries and universities.

The biggest payoffs for the Air Force in using this system is management support to environmental restoration decision makers. The Construction Cost Management Directorate chaired pricing exercises for all major commands, their service agents, and support contractors on the multimillion dollar Air Force restoration program. Costing errors as well as recommendations for alternative clean-up technologies were identified in these pricing exercises. For example, in the Base Realignment and Closure Rounds I and II independent review, approximately $111 million (of a $435 million baseline) were identified and analyzed as potential cost savings. Recommendations to decision makers were made on which savings were constrained by public law, Air Force regulations, EPA interpretation, state regulations, selected technologies, project scoping, or estimating errors.

## Summary

This synopsis of the history and current uses of this academic technology was provided to identify the payoffs directly attributable to this dissertation study and specific contributions to the Air Force from this research. The Civil Engineering Research Foundation study further verifies that the subject of this dissertation is recognized as emerging technology. The high interest and

rating substantiate the strong need for the results of the study in the construction industry. The author is continuing the distribution of the models resulting from this research and the development of new applications for the Air Force.